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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 4
FEBRUARY 15, 1976

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 4
FEBRUARY 15, 1976

W76-01501 -- W76-02000

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

GENERALIZED CRITERIA FOR VERIFICATION OF WATER DEVELOPED THROUGH WEATHER MODIFICATION,
Bittinger M. W. and Associates, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W76-01519

A SCHEME FOR STOCHASTIC STATE VARIABLE WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-01685

BAYESIAN INFERENCE AND DECISION MAKING FOR EXTREME HYDROLOGIC EVENTS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-01761

MATHEMATICAL MODEL FOR ESTABLISHING THE OVERFLOW SPILLWAY DISCHARGES IN THE FLOOD STORAGE PONDS,
Academia de Studii Economics, Bucharest (Rumania). Dept. of Economic Cybernetics.
For primary bibliographic entry see Field 4A.
W76-01762

LONG-TERM FLOOD PREDICTION FROM SHORT-TERM RIVER DATA.
For primary bibliographic entry see Field 4A.
W76-01776

STORM RUNOFF IN THE VICINITY OF OAK RIDGE, TENNESSEE,
Oak Ridge National Lab., Tenn.
J. D. Sheppard.
Available from the National Technical Information Service, Springfield, Va 22161 as ORNL TM4662, $4.00 in paper copy, $2.25 in microfiche. Report No. ORNL-TM-4662, October 1974. 24 p, 10 fig, 1 tab, 22 ref. ERDA W-7405-eng-26.

Descriptors: *Rainfall-runoff relationships, *Storm runoff, Hydrology, *Streamflow, *Flow duration, *Frequency analysis, Rainfall, Runoff, Meteorological data, Probable maximum precipitation, *Tennessee.
Identifiers: *Oak Ridge(Tenn), *Rainfall frequency, Annual series, Exceedance series.

Rainfall in the vicinity of Oak Ridge, Tennessee, from 1948 through 1971 was examined for periodic effects. Many hydrologic studies in the area by various agencies were summarized. Both annual maximum and exceedance series were used to analyze rainfall of various durations. It was shown that a storm containing a 100-year long duration event will not necessarily contain a 100-year short duration event. Flow duration analysis using mean daily flows were presented for gaged catchments ranging in size from 0.38 to 82.5 sq mi. It was shown that the average response of streams in the area to storm conditions, as determined by daily flow duration curves, is linear with drainage area. (Terstriep-ISWS)
W76-01841

ROOT DEPTH AS A SENSITIVE PARAMETER IN A DETERMINISTIC HYDROLOGIC MODEL,
Agricultural Research Service, Beltsville Md. Hydrograph Lab.; and Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
For primary bibliographic entry see Field 2I.
W76-01846

2B. Precipitation

ON TH VARIABILITY OF 'DYNAMIC SEEDABILITY' AS A FUNCTION OF TIME AND LOCATION OVER SOUTH FLORIDA. PART II. TEMPORAL VARIABILITY,
National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
W. R. Cotton, and A. Boulanger.
Journal of Applied Meteorology, Vol 14, No 7, p 1376-1382, October 1975. 7 fig, 4 ref.

Descriptors: *Weather modification, *Cloud seeding, *Florida, Atmosphere, Sounding, Temperature, Humidity, Rainfall, Precipitation(Atmospheric), Artificial precipitation, Model studies, Mathematical models, Cloud physics, Meteorology.

Using the one-dimensional cumulus model developed by Cotton, predictions of the effects of seeding cumulus clouds were performed during the month of July 1973 as part of the Experimental Meteorology Laboratory's Florida Area Cumulus Experiment 1973 experiment. In Part I seedability predictions with the Miami 1200 GMT soundings were compared with soundings taken over the center of the experimental area (central site) at 1400 GMT. It was found that substantial differences between the two predictions occurred on a number of days in spite of the fact that the soundings were separated in time by only 2 h and in space by only 110 km. Here the seedability predictions with the MIA 1200 GMT soundings and the CS 1800 GMT soundings were compared. The CS 1800 GMT soundings were assumed to be representative of conditions over the experimental area during the period of operation of the experiment. It was found that the predictions with the MIA 1200 GMT soundings were, on the average, more representative of conditions over the center of the experimental area during the period of operation of the experiment than were the predictions with the CS 1400 GMT soundings. The results indicated that the choice of a sounding site and sounding time to be used for prediction of seeding effects over an experimental area must be carefully considered in the design of the experiment. (See also W75-12089) (Sims-ISWS)
W76-01529

WEATHER MODIFICATION OPERATIONS IN CALIFORNIA, OCTOBER 1, 1972 - SEPTEMBER 30, 1973,
California State Dept. of Water Resources, Sacramento, Div. of Planning.
For primary bibliographic entry see Field 3B.
W76-01530

THE CLIMATE OF CHIHUAHUA, MEXICO,
Texas Univ. at El Paso. Geological Sciences.
R. H. Schmidt, Jr.
The University of Arizona Institute of Atmospheric Physics, Technical Reports on the Meteorology and Climatology of Arid Regions, No 23, 1975, 50 p, 29 fig, 18 ref.

Descriptors: *Climatology, *Mexico, *Semiarid climates, *Precipitation(Atmospheric), Climates, Climatic data, Meteorology, Temperature, Topography, Weather, Weather data, Arid climates, Humid climates, Rainfall, Meteorological data, Altitude.
Identifiers: Chihuahua(Mexico).

The climatological data used in this study, which is derived from seven agencies in Chihuahua which operate a combined total of about 130 meteorological stations in the state, represent a relatively short record (10-15 years). The mean annual precipitation for the state is 409 mm, the average temperature is 16 C with record extremes of minus 30 C and 48 C. Most of the state's precipitation falls in the form of rain during brief summer thundershowers. A comparison between the mean and median indicates that annual temperatures are near stabilization and annual precipitation totals are not. The state's two major climatic groups are closely associated with the geomorphic units. The arid and semiarid zone of the state generally coincides with the Basin and Range, and the humid mesothermal climates are found in the Sierra Madre Occidental. (Robinett-Arizona)
W76-01703

SURFACE ALBEDO AND DESERTIFICATION,
Agricultural Research Service, Water Conservation Lab. Phoenix, Ariz.
R. D. Jackson, and S. B. Idso.
Science, Vol 189, p 1012-1013, September 19, 1975, 1 fig, 10 ref.

Descriptors: *Albedo, *Deserts, *Vegetation effects, *Soil surfaces, *Rainfall, Arid lands, Grazing, Vegetation, Soil-water-plant relationships, Soil physical properties, Temperature, Soil temperature.
Identifiers: *Surface albedo, *Desertification, Overgrazing.

Evidence is offered and a theory is presented for disclaiming the hypothesis by Otterman which states that when high-albedo soils are denuded (vegetation removed by overgrazing), the resultant increase in surface albedo causes lower surface temperatures, which in turn reduce the heat input to the lower atmosphere, decrease its temperature lapse rate, and hence somewhat reduce convective activity leading to rainfall. From results of experimentation, the authors predict that the denuded surface would be warmer than the vegetated one. It is believed that Otterman's assumed value of 0.9 for emissivity for both the bare and vegetated areas could have introduced temperature errors as great as 8 C. (Robinett-Arizona)
W76-01705

LONG-TERM STREAMFLOW RECORDS RECONSTRUCTED FROM TREE RINGS,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
C. W. Stockton.
Paper of the Laboratory of Tree-Ring Research No. 5, University of Arizona Press, Tucson, 1975. 111 p.

Descriptors: *Dendrochronology, *Streamflow, *Colorado River Basin, *Time series analysis, *Climatology, Rainfall, History, Trees, Average flow, Hydrology, Runoff, Streams, Streamflow forecasting, Colorado River, River basins, Hydrologic data, Droughts, Statistical methods, Frequency analysis, Precipitation(Atmospheric).
Identifiers: Tree rings, Bright Angel Creek Basin(Ariz), Hydrologic records, San Francisco River Basin(New Mexico), Lees Ferry(Ariz), Wet periods, Dendrohydrology, Streamflow record.

A study to investigate the use of tree-ring series for augmenting hydrologic records is described. Two watersheds, the Bright Angel Creek Basin in north-central Arizona and the San Francisco River Basin in west-central New Mexico, are studied and the knowledge gained then applied to the Upper Colorado River Basin. The subject of the investigation is the variablity in the response of the runoff to climatic parameters, and the corresponding response of the tree-ring series. Results indicate that the longterm mean runoff at Lees Ferry (a point just below the northern Arizona border on

the Colorado River) is about 13 million acre-ft. per year, the variance (in million acre-ft. squared) is 13.95, very serious droughts occurred during the periods 1565-1600 and 1870-1890, and the two extended periods of maximum runoff that occurred during the past 400 years were immediately preceded by a period of extended low runoff. (Robinett-Arizona)
W76-01708

HEAVY FALL AND WINTER RAIN IN THE CAROLINA MOUNTAINS,
National Weather Service, Garden City, N.Y. Eastern Region.
D. B. Gilhousen.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-74 11761, $3.50 in paper copy, $2.25 in microfiche. NOAA Technical Memorandum NWS ER-57, October 1974. 6 p, 3 fig, 1 ref.

Descriptors: *Excessive precipitation, *Rainfall, *Mountains, *North Carolina, *South Carolina, Floods, Winter, Autumn, Precipitable water, Air circulation, Atmosphere, Precipitation(Atmospheric), Weather patterns, Weather, Runoff forecasting, Meteorology.
Identifiers: *Carolina mountains.

There were eight known days in the period Ocotober 1, 1972 to March 31, 1973 in which more than two inches of rain occurred at any North or South Carolina Mountain Station. These cases were studied to see if common patterns could be identified to assist in recognizing the threat of heavy rain. The study focused on the 850, 500, 300 mb. analyses, precipitable water and stability charts available just prior to the onset of heavy rain. Also considered were the latest trajectory model forecasts that were available prior to the occurrence of heavy rain. Common characteristics were found in the synoptic scale patterns and trajectory model forecasts available prior to the onset of heavy rain. In the future, if these features are identified in the fall and winter months, the threat of locally heavy rain is established. The extent of over-warning, however, is not known since it was not determined how often these features occurred and heavy rain did not fall. (Sims-ISWS)
W76-01830

STORM RUNOFF IN THE VICINITY OF OAK RIDGE, TENNESSEE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2A.
W76-01841

FORMATION OF CLOUD AND ICE NUCLEI BY THE COMBUSTION OF CRUDE OIL,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
C. C. Van Valin, R. F. Pueschel, and F. P. Parungo.
Journal of Applied Meteorology, Vol 14, No 6, p 1200-1203, September 1975. 2 fig, 1 tab, 11 ref.

Descriptors: *Nucleation, Oil wells, *Burning, Smoke, Oil, Chemistry, Aircraft, Sampling, Surveys, On-site investigations, Pollutants, Air pollution, Meteorology, *Pollutant identification, Cloud physics, Ice, *Wyoming.
Identifiers: *Oil well fires, *Glenrock(Wyo), Aitken nuclei concentrations, Ice nuclei concentrations, Plumes.

Aitken nuclei and ice nuclei concentrations in the smoke plume from an oil well fire at Glenrock, Wyoming, on Dec. 14, 1973 were found to be elevated by at least an order of magnitude as compared with the surrounding atmosphere. The composition of most particles in the plume was suggestive of the clay minerals; these could account for the increased ice nuclei concentrations. (Sims-ISWS)
W76-01857

A COMPARISON OF CANADIAN AND UNITED STATES STANDARD METHODS OF MEASURING PRECIPITATION,
Windsor Univ. (Ontario). Dept. of Geography.
M. Sanderson.
Journal of Applied Meteorology, Vol 14, No 6, p 1197-1199, September 1975. 2 fig, 2 tab, 6 ref.

Descriptors: *Precipitation(Atmospheric), *Measurement, *Rain gages, *Canada, *United States, Snowfall, Rainfall, Gages, Data collections, Methodology, Meteorology.
Identifiers: Comparison of methods.

Methods of measuring precipitation vary from country to country. Consequently, the comparability of precipitation data along international borders is questionable. Five years of precipitation data at Windsor, Ontario, using the standard Canadian and United States methods of measuring precipitation were compared. Monthly rain amounts were very similar, but substantial differences existed in snow measurement. The Canadian method appeared to overestimate precipitation from snowfall. (Sims-ISWS)
W76-01858

ESTIMATION OF THE DISRUPTIVE IMPACT OF SNOWFALLS IN URBAN AREAS,
Queensland Univ., Brisbane (Australia). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-01859

RADAR REFLECTIVITY FACTOR CALCULATIONS IN NUMERICAL CLOUD MODELS USING BULK PARAMETERIZATION OF PRECIPITATION,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
P. L. Smith, Jr., C. G. Myers, and H. D. Orville.
Journal of Applied Meteorology, Vol 14, No 6, p 1156-1165, September 1975. 8 fig, 18 ref. NSF GA-36910X, Bureau of Reclamation 14-06-D-6976.

Descriptors: *Radar, *Hail, *Model studies, Mathematical models, Computer models, Precipitation(Atmospheric), Remote sensing, Rain, Raindrops, Size, Storms, Thunderstorms, Meteorology.
Identifiers: *Radar reflectivity factor, Numerical cloud models, Hail size distribution.

Various methods for calculating radar reflectivity factors in numerical cloud models that use bulk methods to characterize the precipitation processes were described and compared. Equations sensitive to changes in the parameters of the particle size distributions were favored because they allow simulation of phenomena causing such changes. Marshall-Palmer-type functions were established to represent hailstone size distributions because the previously available distributions lead to implausibly large reflectivity factors. Simplified equations were developed for calculating reflectivity factors for both dry and wet hail. Some examples were given of the use of the various equations in numerical cloud models. (Sims-ISWS)
W76-01860

2C. Snow, Ice, and Frost

OPERATIONAL SYSTEMS FOR SNOW REMOVAL AND ICE CONTROL: A BACKGROUND/RESOURCE PAPER FOR THE UPPER GREAT LAKES UNIVERSITY CONSORTIUM FOR TRANSPORTATION RESEARCH,
Michigan Technological Univ., Houghton, Mich.
For primary bibliographic entry see Field 4A.
W76-01591

PREVENTION OF FRAZIL ICE CLOGGING OF WATER INTAKES BY APPLICATION OF HEAT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W76-01832

A FRAZIL ICE CONCENTRATION MEASURING SYSTEM USING A LASER DOPPLER VELOCIMETER,
Bendix Corp., Davenport, Iowa. Instruments and Life Support Div.
C. C. Schmidt, and J. R. Glover.
Journal of Hydraulic Research, Vol 13, No 3, p 299-314, 1975. 5 fig, 6 ref. NSF GK35918X1.

Descriptors: *Frazil ice, *Instrumentation, *Laboratory equipment, *Electronics, Ice, Velocity, Measurement, Temperature, Data collections.
Identifiers: *Laser Doppler Velocimeter, Ice particles, Concentration, Icing, Optical scattering.

A laboratory instrument to measure frazil ice was developed by designing special electronics to process the signal produced by a commercial Laser Doppler Velocimeter. The system performance was evaluated by comparing experimental measurements with theoretical results. The upper concentration that could be measured was not determined. The system limitations were discussed. The instrument was calibrated to provide measurements of flow velocity and frazil ice concentration without flow disturbance and icing problems. (Adams-ISWS)
W76-01850

A COMPARISON OF CANADIAN AND UNITED STATES STANDARD METHODS OF MEASURING PRECIPITATION,
Windsor Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W76-01858

ESTIMATION OF THE DISRUPTIVE IMPACT OF SNOWFALLS IN URBAN AREAS,
Queensland Univ., Brisbane (Australia). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-01859

2D. Evaporation and Transpiration

SOYBEAN AND CORN ROOTING IN SOUTHWESTERN MINNESOTA: II. ROOT DISTRIBUTIONS AND RELATED WATER INFLOW,
Agricultural Research Service, Pendleton, Oreg.
R. R. Allmaras, W. W. Nelson, and W. B. Voorhees.
Soil Science Society of America Proceedings, Vol 39, No 4, p 771-777, July-August 1975. 3 fig, 8 tab, 30 ref.

Descriptors: *Root systems, *Corn(Field), *Soybeans, *Absorption, *Inflow, *Minnesota, Soil water movement, On-site investigations, Soil properties, Hydraulic conductivity, Plant growth, Moisture stress, Plant populations, Root development, Harvesting, Crop production, Soil-water-plant relationships, Depth, Mathematical models, Regression analysis, Resistance.
Identifiers: *Root length density, *Specific water inflow, Determinate isoline, Indeterminate isoline.

Root length density (RLD) of corn and two isolines (determinate and indeterminate) of Harosoy soybean in a Nicollet soil were measured from July 1 to August 15, 1971. Both soybean isolines had about 0.2 cm/cu cm RLD in the Ap layer with values less than 0.1 below the Ap layer. The RLD distribution persisted with depth as the

root system expanded vertically. Corn RLD were about 0.3 initially in the Ap layer, and as the root system expanded vertically, maximum RLD of about 0.3 was produced even to the 100-cm depth on August 9. Vertical extension rates of corn after July 1 were 1.3 cm/day as compared with 1.7 for soybeans, but maximum rooting depths on August 9 were 145 and 120 cm, respectively. Modal specific water inflows were 0.03 cu cm/cm root per day. Maximal values for soybeans were 0.2; maximal values for corn were about 0.05. Maximum soybean rooting depths coincided with maximum depth of water uptake sink, but corn rooting depths ranged 15 to 30 cm deeper than the water uptake sink. Specific water inflow generally increased as soil hydraulic conductivity increased and RLD decreased, which agrees with models for steady-state water flow into single roots. At low RLD, specific water inflows were either constant or increased as hydraulic conductivity decreased. (Visocky-ISWS)
W76-01528

CANAL EVAPORATION DETERMINED BY THERMAL MODELING,
Geological Survey, Bay Saint Louis, Miss.
H. E. Jobson.
Reprint from Proceedings of the Symposium on Modeling Techniques held at San Francisco Calif, September 3-5, 1975: American Society of Civil Engineers, p 729-743, 1975. 5 fig, 17 ref, 2 append.

Descriptors: *Model studies, *Evaporation, *Surface waters, *Water temperatures, Canals, Finite element analysis, Analytical techniques, Equations, Winds, Channel morphology, Heat transfer, Correlation analysis, Forecasting, *California.
Identifiers: *San Diego Aqueduct(Calif).

The thermal balance of the 26-kilometer San Diego Aqueduct in southern California was studied to determine the manner in which the surface exchange varies with meteorologic factors. Meteorologic and hydraulic variables, as well as the water temperature at each end of the canal, were continuously monitored. Data were analyzed in the Eulerian framework by use of a one-dimensional, finite-difference model. Field measurements indicated the water temperature was well mixed in the cross section. The model predicts the temperature at the downstream end of the canal as a function of time. Analyzing 12 days of data, the mass-transfer coefficient in the Dalton-type evaporation equation was varied by trial and error until the predicted and measured downstream temperatures most nearly agreed in the least-squares sense. The root-mean-square error of the predicted temperature was quite sensitive to the mass-transfer coefficient. Another finite-difference model was constructed which allows the data to be analyzed in the Lagrangian framework. This model allows the construction of a graph of the Dalton wind function versus windspeed. Within the range of 0.5 to 4 meters per second the wind function appeared to vary linearly with windspeed. The mass-transfer coefficient developed for lakes provides a reasonable approximation of the wind function provided the short effective fetch of a stream is properly accounted for. (Woodard-USGS)
W76-01582

EVAPOTRANSPIRATION OF DRYLAND BARLEY WITH DIFFERENT PLANT SPACING PATTERNS,
California Univ., Riverside.
R. E. Luebs, A. E. Laag, and P. A. Nash.
Agronomy Journal, Vol 67, No 3, p 339-342, May-June, 1975. 1 fig, 3 tab, 6 ref.

Descriptors: *Evapotranspiration, *Crop production, *Crop response, *Planting management, *Barley, Drought resistance, Growth stages, Plant growth, Water requirements, Water utilization, Lysimeters, Soil moisture, Transpiration, Plant physiology, Soil-water-plant relationships, Moisture stress, Canopy.
Identifiers: *Plant spacing patterns, Hordeum vulgare L., Leaf area index, Row spacing.

Results are reported of an experiment which was conducted during the 1969-70 growing season near Riverside, California, to study the effect of plant spacing patterns of dryland barley (Hordeum vulgare L.) on leaf area index, crop canopy, evapotranspiration, and yield. The minimum unit area of equal plant population density for all spacing patterns was 240 sq cm. Crop canopy and leaf area index were lowest for the grid spacing pattern (8.3-cm row spacing with seeds spaced 7.4 cm in the row) largely because of less tillering. The paired-row pattern (8.1 cm spacing between rows in a pair and 24.3 cm between pairs with seeds spaced 3.7 cm in the row) had highest leaf area index but intermediate crop canopy during the vegetative phase with adequate water. Slightly greater evapotranspiration values were found during the first two-thirds of the growing season for the standard row pattern (16.3-cm row spacing with plants spaced 3.7 cm in the row) which resulted in greater water stress and lower evapotranspiration values later in the season, but grain yield was not affected. (Robinett-Arizona)
W76-01697

ESTIMATING EVAPOTRANSPIRATION UNDER NONHOMOGENEOUS FIELD CONDITIONS,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
L. H. Parmele, and E. L. Jacoby, Jr.
NE-51, April, 1975. 61 p, 8 fig, 4 tab, 32 ref, 4 append.

Descriptors: *Evapotranspiration, *Topography, *Micrometeorology, *Energy budget, Ohio, Small watersheds, Slopes, Microclimatology, Lysimeters, Evaporation, Soil moisture, Transpiration, Water loss, Estimating equations, Meteorology.
Identifiers: *Rolling topography, North Appalachian Experimental Watershed(Coshocton Ohio), Bowen ratio, Evapotranspiration estimation, Roughness length parameter.

This study was conducted on a watershed with a slope of 13 percent, consisting of rolling-surface topography, located in the North Appalachian Experimental Watershed, Coshocton, Ohio. Detailed micrometeorological measurements were made during selected days throughout 1969 using a lysimeter in order to test the application of commonly used meteorological methods of estimating evapotranspiration under conditions of rolling terrain. The Bowen ratio energy budget method proved superior to the stability-adjusted aerodynamic methods in comparing hourly lysimeter flux rates. Computations agreed with the lysimeter for bare soil and for corn 75 cm high. However, for corn higher than 75 cm, the roughness length parameter was adjusted to an unusually low value of 1.0 cm in order to best fit the combination equation. Methods are presented for making probable-error analysis of evapotranspiration estimates through meteorological methods. (Robinett-Arizona)
W76-01707

WATER BALANCE STUDIES,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria). Div. of Atomic Energy in Food and Agriculture.
For primary bibliographic entry see Field 3F.
W76-01882

WATER REQUIREMENTS OF CROPS,
Soil Inst., Tehran (Iran).
For primary bibliographic entry see Field 3F.
W76-01884

2E. Streamflow and Runoff

RELATIONSHIPS OF LOW, AVERAGE AND FLOOD FLOWS FOR STREAMS IN THE PACIFIC NORTHWEST,
Washington State Univ., Dept. of Civil and Environmental Engineering. Pullman.
J. F. Orsborn, F. D. Deane, M. T. Arce, and J. P. Ahlers.
Available from the National Technical Information Service Springfield, Va 22161 as PB247-103, $4.50 in paper copy, $2.25 in microfiche. Completion Report, June 30, 1975. 61 p, 20 fig, 5 tab, 24 ref, 2 append. OWRT A-074-WASH(1). 14-31-0001-5048.

Descriptors: Hydrologic data, *Streamflow, *Floods, *Low flow, *Average flow, *Pacific Northwest U.S.
Identifiers: Average, *Flow correlations, Ungaged streamflow.

Research conducted on the water resources of six State Water Program study areas for the Washington Department of Ecology has exposed numerous opportunities for improving methods of hydrologic analysis for ungaged streams. Gaged streamflow characteristics within hydrologic provinces display relationships with respect to particular physical parameters of their drainage basins. Floods are more difficult to correlate with basin parameters than are low flows. But, low, average annual, and flood flows can be related with each other for basins within hydrologic provinces. The low flow of an ungaged stream is determined using the basin-geomorphic parameter method. The average annual flow is estimated from a plot of average annual precipitation and drainage area for gaging stations in the province. By knowing both the low and average annual flows, two-year and 50-year flood flows can be quickly determined. Many options for determining ungaged streamflows are opened by having these correlations of low, average, and flood flows available. Results of a research project on the relationships between low, average, and flood flows for selected stream gaging stations in the Pacific Northwest are presented. (Bechard-Washington State)
W76-01507

HYDROLOGIC UNIT MAP--1974, STATE OF WISCONSIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01571

HYDROLOGIC UNIT MAP--1974, STATE OF HAWAII.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01572

HYDROLOGIC UNIT MAP--1974, STATE OF GEORGIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01573

HYDROLOGIC UNIT MAP--1974, STATE OF ILLINOIS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01574

SUMMARY OF FLOODS IN THE UNITED STATES DURING 1969,
Geological Survey, Reston, Va.
J. K. Reid.
Available from Superintendent of Documents, GPO, Washington, DC 20402, price $1.90. Water-Supply Paper 2030, 1975. 173 p, 57 fig, 44 tab, 41 ref.

Descriptors: *Floods, *United States, *Flood data, *Flood damage, Hydrologic data, Streamflow, Peak discharge, Flood flow, Storms, Hurricanes, Tidal effects, Flood stages.
Identifiers: *Floods(USA-1969).

The most outstanding floods in the United States during 1969 are described in chronological order. The areas most seriously affected by flooding were: Central and southern California (January and February); the upper Midwestern States of North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, and Illinois (April); north-central Ohio (July); Mississippi, Alabama, and Virginia (Hurricane Camille in August); and Florida and Georgia (September). Hurricane Camille was the most intense hurricane on record to enter the United States mainland. It struck the Mississippi-Alabama coast on August 18, with tidal waves as high as 25 feet above mean sea level and wind velocities more than 190 miles per hour. Tidal wave and flood damage was about $1.3 billion. In Mississippi the known dead totaled 139 and 76 other persons were missing. The hurricane caused record-breaking floods of streams also in a 50-mile-wide area from Sulphur Springs, W. Va., to Fredericksburg, Va. Total flood damage in Virginia exceeded $116 million. There were 113 known deaths, 102 injuries, and 39 people missing. (Woodward-USGS)
W76-01576

GENERAL MODEL TO SIMULATE FLOW IN BRANCHED ESTUARIES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W76-01580

MAP SHOWING FLOOD OF APRIL 1975 AT MERIDIAN TOWNSHIP, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-01584

GEOLOGIC CONTROL OF SUPPLY AND QUALITY OF WATER IN THE MOUNTAINOUS PART OF JEFFERSON COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-01585

THE RIVER'S REACH: AN ASSESSMENT OF EXISTING FLOOD PROTECTION IN UPSTREAM WATERSHEDS OF THE CONNECTICUT RIVER BASIN.
Soil Conservation Service, Durham, N.H.
For primary bibliographic entry see Field 4A.
W76-01592

A SCHEME FOR STOCHASTIC STATE VARIABLE WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
V. T. Chow, D. H. Kim, D. R. Maidment, and A. T. Ula.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 299, $5.50 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana. Research Report No 105, October 1975, 102 p, 18 fig, 6 tab, 71 ref, append. OWRT B-084-ILL (2) 14-31-0001-4080.

Descriptors: *Dynamic programming, *Optimization, *Systems analysis, *Model studies, Streamflow, Synthetic hydrology, *Stochastic processes.

The development of an analytical scheme for the formulation and optimization of water resources systems is described. The scheme being proposed and investigated is to model the stochastic input of annual as well as monthly streamflows to a hydrologic and water resources system, to formulate the system in a state variable format, and to optimize the stochastic state variable model so formualted by dynamic programming. For annual streamflows, a second-order autoregressive model with a data-based transformation is proposed, and both the maximum likelihood method and the Bayesian approach are used for estimating the model parameters. For monthly streamflows, two linear models are proposed, one is the regression model and the other is the functional relationship model, and their consideration of both uncorrelated and correlated errors and their techniques of generation by a stationary Markov process are discussed. The proposed state variable approach provides a generalized framework within which many different kinds of system models may be expressed and combined for the representation of a given hydrologic and water resources system. This simple yet general format is a major advantage of the proposed state variable modeling. While the annual or monthly streamflows are generated as stochastic inputs to the state variable system model by the proposed scheme, a new procedure of optimization of the system by stochastic dynamic programming is developed. Although the research effort should be further extended to the development of practical procedures for application, a few simple examples are given to illustrate the validity of such applications.
W76-01685

LONG-TERM STREAMFLOW RECORDS RECONSTRUCTED FROM TREE RINGS,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
For primary bibliographic entry see Field 2B.
W76-01708

LONG-TERM FLOOD PREDICTION FROM SHORT-TERM RIVER DATA.
For primary bibliographic entry see Field 4A.
W76-01776

2F. Groundwater

HYDROGEOLOGY OF GLACIAL DEPOSITS IN TIPPECANOE COUNTY, INDIANA, SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING WATER RESOURCES IN MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
A. M. S. Marrouf, and N. Melhorn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 093, $6.00 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 61, June, 1975. 107 p, 26 fig, 9 tab, 50 ref, append. OWRT C-3277(No 3713) (7).

Descriptors: *Groundwater Resources, *Groundwater basins, *Glacial aquifers, *Aquifer management, Geohydrology, Glacial drift, Outwash, Pleistocene epoch, Groundwater, Water sources, Groundwater availability, Water supply, Perched water, Hydrologic budget, Underground streams, Water storage, *Indiana.
Identifiers: Illinoian glacier, Wisconsin glacier, Teays River Channel, glacial Lake, Lafayette, Wabash River drainage, Tippecanoe County(Ind).

The unconsolidated glacial deposits of Tippecanoe County average about 200 feet in thickness. Analysis of subsurface data indicates that the pre-Pleistocene drainage system does not coincide with the present drainage network. The most significant aquifers occur in the glacial drifts. Illinoian age outwash deposits are the most extensive and most highly developed aquifers, but pre-Illinoian and Wisconsin outwash aquifers are also extensive and have not been significantly utilized. In this report, the distribution of aquifers are mapped and their lithologic, stratigraphic, and hydrogeologic aspects analyzed. Most water wells in the county are less than 200 feet and yield from 5 to 2000 GPM. The present total pumpage is about 35 MGPD, and there is no apparent long-term continuous decline in water level. Future development of groundwater resources in the Lafayette Urban Area is most favorable in unexploited areas of thick sand and gravel aquifers which occupy the Teays, Anderson, Clarks Hill and other pre-glacial valleys in bedrock. Limited geochemical data suggest that there is no significant deterioration of water quality. Future land use planning should recognize the location of the most promising aquifers to protect the groundwater reserves.
W76-01521

UNIQUENESS OF A MODEL OF STEADY-STATE GROUND-WATER FLOW,
Nevada Univ., Reno. Desert Research Inst.
R. L. Cooley, and P. J. Sinclair.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247-097, $4.00 in paper copy, $2.25 in microfiche. Water Resources Research Center, Reno, Hydrology and Water Resources Publication No 22, August 1975. 39 p, 6 fig, 9 tab, 17 ref. OWRT A-054-NEV (1) 14-31-0001-4028.

Descriptors: *Aquifer characteristics, Hydrologic budget, Mathematical models, *Base flow, *Groundwater movement, Model studies, *Nevada.
Identifiers: *Truckee Meadows(Nev).

The main objective was to investigate the conditions necessary to determine bounds on values of the hydrogeologic parameters which characterize a model of steady-state, areal, near surface, ground-water flow. A second objective was to develop a quantitative characterization of the ground-water flow system in Truckee Meadows, Nevada. An inverse method of determining the parameters was employed allowing the parameters to be calculated from the known hydraulic head distribution. Results showed that data collection and use of a reliable inverse method are complementary. Early application of an inverse method in a study would indicate areas where data are contradictory or inadequate and where the gathering of additional critically placed data should (if possible) continue until there is no material change in results of the model. At this point, provided the model is theoretically adequate, the data can be sufficient. (Fallon-Nevada)
W76-01526

GEOLOGIC CONTROL OF SUPPLY AND QUALITY OF WATER IN THE MOUNTAINOUS PART OF JEFFERSON COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-01585

GROUND WATER IN SELECTED AREAS IN THE KLAMATH BASIN, OREGON,
Geological Survey, Portland, Oreg.
A. R. Leonard, and A. B. Harris.
Oregon State Engineer, Salem, Ground Water Report No 21, November 1974. 104 p, 14 fig, 5 plate, 10 tab, 12 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Oregon, Water wells, Well data, Water yield, Groundwater recharge, Water level fluctuations, Chemical analysis, Water supply.
Identifiers: *Klamath basin(Oreg).

Groundwater features of six lowland areas in the Klamath Basin of Oregon--Klamath Marsh area, and Sprague River, Swan Lake, Yonna, Poe, and Langell Valleys--are described. Rugged mountains and ridges surround and separate these lowlands where floors range in altitude from 4,100 feet in

Poe Valley to 4,600 feet north of Klamath Marsh. The six areas extend over a north-south distance of 70 miles, an east-west distance of 40 miles, and include an area of approximately 600 square miles. The area is semiarid and received about 14 to 18 inches of precipitation a year. Extinct volcanoes and their extrusions characterize the area. Most wells tap permeable basalt or cindery rubble beneath the lacustrine beds. The depths of wells range from less than 50 to nearly 2,000 feet--most are between 100 and 1,000 feet deep. Flowing wells occur in all areas except Swan Lake Valley. The most extensive area of flowing wells is in the Sprague River valley, where about 25 wells, some flowing more than 2,000 gpm, supply water for irrigation. Water levels in wells fluctuate seasonally from 1 to 4 feet. Groundwater in the basin is of excellent quality for drinking, irrigation, and most industrial uses. (Woodard-USGS)
W76-01590

BI-LEVEL SUBSURFACE DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
D. W. DeBoer, and S. T. Chu.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 4, p 664-667, July-August 1975. 4 fig, 6 ref.

Descriptors: *Subsurface drainage, *Equations, Steady flow, Unsteady flow, Water table, Dupuit-Forchheimer theory, Drainage systems, Depth, Irrigation, Economics, Elevation, Height, Percolation, Hydraulic gradient, Velocity, Hydraulic conductivity.
Identifiers: *Bilevel drainage, Analytical solutions, Drain line depth, Drain line spacing, Streamlines.

Two analytical solutions were derived for a bi-level subsurface drainage situation where drain lines are located at two depths on an alternating basis. The first solution described the steady state situation, while the second was applicable to the falling water table situation. Both solutions were based on the validity of the Dupuit-Forchheimer assumptions. The derived solutions have not been verified by independent data. These solutions should be applicable for the design of bi-level drainage systems and for the design of remedial drainage measures when an existing drainage system is underdesigned. (Vixocky-ISWS)
W76-01847

2G. Water In Soils

LIQUID CHROMATOGRAPHIC ANALYSES IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W76-01636

PAPER CHROMATOGRAPHIC ANALYSIS IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W76-01638

DISPERSION AS AN INDEX OF RELATIVE HYDRAULIC CONDUCTIVITY IN SALT-AFFECTED SOILS OF THE SUDAN,
Khartoum Univ., Khartoum (Sudan). Dept. of Biochemistry and Soil Science.
K. S. Hamid, and M. A. Mustafa.
Geoderma, Vol 14, No 2, p 107-114, August, 1975. 4 fig, 1 tab, 16 ref.

Descriptors: *Hydraulic conductivity, *Dispersion, *Soil dispersants, *Saline soils, *Soil chemistry, Infiltration, Percolation, Permeability, Pores, Africa, Salts, Land reclamation, Salinity, Arid lands, Soil types, Electrolytes, Soil chemical properties, Soil management, Alkalinity, Irrigation water, Irrigation effects, Water quality.
Identifiers: Dispersion index, Exchangeable sodium percentage, *Electrolyte concentration, *Sudan, Aridisols, Vertisols.

Experimentation on two samples selected from an Aridisol and a Vertisol showed that relative hydraulic conductivity increased whereas dispersion index decreased as exchangeable sodium percentage decreased and electrolyte concentration increased. The dispersion index was found to account for over 80 percent of the variability of relative hydraulic conductivity of a salt affected sample and could thus be used to predict relative hydraulic conductivity. For tentative use of the presented prediction procedure, a dispersion index of 13 for similar Aridisols and 8 for Vertisols could be used as a guide, suggesting the need for improving irrigation water quality. In addition, the validity of this prediction procedure still remains to be tested on soils in situ before it can be established as a field practice. (Robinett-Arizona)
W76-01694

FATE OF NITROGEN IN SEWAGE EFFLUENT APPLIED TO SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5B.
W76-01696

DETECTION OF SOIL MOISTURE BY REMOTE SURVEILLANCE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, R. D. Jackson, and R. J. Reginato.
American Scientists, Vol 63, No 5, p 549-557, September-October, 1975. 3 fig, 64 ref.

Descriptors: *Remote sensing, *Soil moisture, *Moisture content, *Electromagnetic waves, *Radiation, Wind erosion, Evapotranspiration, Soil management, Soil-water-plant relationships, Albedo, Water utilization, Infrared radiation, Microwaves, Planting management, Crop production, Agriculture, Insect control, Plant physiology, Plant viruses, Plant diseases, Soil erosion, Hydrologic budget.
Identifiers: Short-wave radiation.

An attempt is made to show how soil moisture data acquired by remote sensing from aircraft or satellites may be used to improve human life. Three general regions of the electromagnetic spectrum are being used today in feasibility studies of remote sensing of soil moisture: the visible, or short-wave region; the thermal, or long-wave region; and the radar, or microwave region. One of the primary benefits of remote detection of soil moisture would be prediction of agricultural production. Knowledge of soil-water content can also greatly assist man in coping with the various insect pests that regularly ravage farmlands, and can aid in the prediction of plant disease (water content is one of the most important aspects of the soil environment influencing the growth and survival and soil-borne plant pathogens). Other applications of soil moisture prediction include use in making crop planting decisions, in determining soil erosion probability, and in problems associated with solving the water balance equation for river basins. (Robinett-Arizona)
W76-01706

A FIELD STUDY ON THE RELATIONSHIP OF TEMPERATURE AND ICE TO INFILTRATION AT A SPRAY IRRIGATION FACILITY,
Michigan State Univ., East Lansing. Dept. of Civil and Sanitary Engineering.
T. S. Vinson, and B. E. Davidson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 516, $5.50 in paper copy, $2.25 in microfiche. Completion Report Institute of Water Research, Michigan State University, November 1975. 121 p, 57 fig, 6 tab, 48 ref, 2 append. OWRT A-079-MICH(1). 14-31-0001-3522.

Descriptors: *Land application of wastewater, *Wastewater management, *Reclamation, Hydrologic cycle, Spray irrigation, Evapotranspiration, Temperature control, Infiltration, Frozen soils.
Identifiers: *Water quality management project, Infiltration, Water movement in frozen soil.

Data on air, surface and ground temperatures, and infiltration were collected from three sites at a spray irrigation area during the first winter spray program. Two contiguous sites received six spray applications during the winter months. A third site was used as a control site and received no spray application. Soil temperatures were monitored at each site using thermistors at depths of 0.0 ft., 0.25 ft., 0.5 ft., 1.0 ft., 3.0 ft., and 10.0 ft. A continuous temperature recorder was used to measure ambient air temperatures. Natural precipitation was recorded by a 'weighing bucket' types rain guage. Spray application was measured by nonweighing rain gauges. Infiltration was monitored by three lysimeters at depths of approximately 1.0 ft., 3.0 ft., and 5.0 ft. at each site.
W76-01810

RESPONSE OF SATURATED SANDS TO CYCLIC SHEAR AT EARTHQUAKE AMPLITUDES,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 8D.
W76-01814

DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING THERMAL INFRARED IMAGERY,
Alabama Univ., Huntsville. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-01840

ROOT DEPTH AS A SENSITIVE PARAMETER IN A DETERMINISTIC HYDROLOGIC MODEL,
Agricultural Research Service, Beltsville Md. Hydrograph Lab.; and Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
For primary bibliographic entry see Field 2I.
W76-01846

BI-LEVEL SUBSURFACE DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W76-01847

A WATERSHED SOILS INDEX OF RUNOFF POTENTIAL,
Agricultural Research Service, Coshocton, Ohio.
J. L. McGuinnes, and W. A. Edwards.
Journal of Soil and Water Conservation, Vol 30, No 4, p 184-186, July-August 1975. 3 fig, 1 tab, 7 ref.

Descriptors: *Runoff, *Soil classification, *Indexing, *Soil properties, *Soil science, *Soil types, *Infiltration, *Hydrology, *Permeability, Soil groups, Storm runoff, Infiltration rates, Hydrologic systems, Agricultural runoff, Drainage.
Identifiers: *Runoff potential, *Coshocton(Ohio), *Soils index, Drainage class, Hydrologic response unit.

A method was presented for the systematic classification of runoff potential of soils. The classification was accomplished by means of a soils index. The index was composed of drainage classes ranging from excessively to very poorly drained, and permeability classes ranging from very rapid to very slow. Seven steps were defined in each class. It was demonstrated that good correlation exists between the soil index described and dormant season runoff for ten Coshocton watersheds. The relationship appeared to be independent of soil cover. All of the watersheds were on a corn-wheat-meadow-meadow rotation, and for a given dormant season, cover varied from a scanty wheat cover to heavy second year meadow. (Terstriep-ISWS)
W76-01848

PHYSICAL INTERPRETATION OF THE DIFFUSION EQUATION PARAMETERS ACCORDING TO MARKOV'S STOCHASTIC PROCESSES THEORY,
Louvain Univ. (Belgium). Dept. de Genie Rural.
C. Laroussi, and L. De Backer.
Soil Science, Vol 120, No 3, p 169-173, September 1975. 2 fig, 7 ref.

Descriptors: *Diffusion, *Unsaturated flow, *Porous media, *Markov processes, *Darcys law, Continuity equation, Diffusivity, Boundary processes, Fluid mechanics, Analytical techniques, Flow.
Identifiers: *Diffusivity coefficient, Moisture profiles.

This study dealt with the derivation of the diffusion equation by considering the displacement of a fluid particle through an unsaturated porous medium as a Markov's stochastic process. The comparison of this equation with that obtained from the combination of Darcy's generalized equation and the equation of continuity allowed assessment of the physical significance of the diffusivity coefficient as well as its partial derivative. The diffusivity coefficient represents the ease with which the fluid particles spread from a zone of high fluid content and it is essentially a function of flow conditions. The physical interpretation of these parameters may be related to the boundary conditions of the flow phenomenon and can help in determining the field of application and the validity limits of the diffusion theory. (Singh-ISWS)
W76-01851

A NOTE ON THE MOISTURE DIFFUSIVITY OF SATURATED SWELLING SYSTEMS FROM DESORPTION EXPERIMENTS,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology and Climatology.
J. Y. Parlange.
Soil Science, Vol 120, No 2, p 156-158, August 1975. 1 fig, 10 ref.

Descriptors: *Soil water movement, *Saturated soils, *Sorption, *Diffusivity, *Mathematical studies, Soils, Soil water, Soil moisture, Soil properties, Moisture, Moisture uptake, Optimization, Infiltration rates, Moisture availability.
Identifiers: *Moisture diffusivity, *Swelling soils, *Nonswelling soils, *Desorption experiments, Sorptivity.

Relations between sorptivity and diffusivity derived for nonswelling materials have been applied recently to swelling materials. It was shown that such applications are invalid and that relations that are specific to swelling materials must be used. A possible relation between sorptivity and diffusivity for swelling materials was proposed for the case of desorption. The results were used to reinterpret experimental observations. (Prickett-ISWS)
W76-01852

EFFECT OF ABRUPT TEXTURAL CHANGE ON POTENTIAL PROFILES DURING STEADY-STATE INFILTRATION,
Iran Plan Organization, Tehran.
M. Bybordi.
Soil Science, Vol 120, No 2, p 92-95, August 1975. 4 fig, 11 ref.

Descriptors: *Soil water movement, *Infiltration, *Soil properties, *Potential flow, *Soil moisture, Water table, Mathematical studies, Analytical techniques, Moisture content, Moisture availability, Soil pressure, Hydraulics, Moisture tension, Hydraulic conductivity, Soil types, Steady flow, Soil texture, Percolation, Infiltration rates, Groundwater movement.
Identifiers: *Layered soils, *Potential profiles.

The effect of abrupt textural change on the shape of the steady-state potential profiles in a layered porous medium was examined both theoretically and experimentally. It was shown that a variety of shapes are possible, depending on the rate of flow, layering sequence, and the hydrologic properties of the layers. Three distinct shapes of the potential profiles and the requirements for their development in a two-layered system were discussed. (Prickett-ISWS)
W76-01853

DESIGN AND USE OF CLOSED-TOP INFILTROMETERS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. M. Dixon.
Soil Science Society of America Proceedings, Vol 39, No 4, p 755-763, July-August 1975. 8 fig, 14 ref.

Descriptors: *Infiltrometers, *Pressure, Surface waters, Pressure head, Infiltration, Instrumentation, Infiltration rates, Porous media, Heterogeneity, Air-earth interfaces, Soils, Data collections, Design, Border irrigation, Loam, Saturation, Soil management, Watershed management, Measurement, Soil surfaces, Boundaries(Surfaces).
Identifiers: *Infiltration measurement, Two-phase infiltration, Soil air pressure, Macroporosity, Surface water head, Air counterflow, Initial conditions.

Several similar closed-top infiltrometers were designed and used to simulated effective surface heads ranging from minus 3 to plus 1 cm of water. Design was based on the principle that natural positive soil air pressure may be simulated by creating an equivalent negative air pressure above ponded surface water. Effective surface head h sub s, defined as the difference between the ponded water depth h sub w, and either the actual or simulated soil air pressure head h sub a, is negative when h sub a is greater than h sub w. Under natural field conditions, negative h sub s often causes counterflow of soil air during water infiltration. Narrow ranges in h sub s surrounding zero greatly affect infiltration by controlling air and water flow in soil macropores and weakly hydrophilic micropores. Thirty-minute cumulative infiltration increased 19% per centimeter increase in h sub s for one soil and 33% per centimeter for another soil. Closed-top infiltrometers make possible realistic infiltration measurements under the negative h sub s commonly produced by rain and irrigation waters as they infiltrate natural soils. These devices may also be useful in studying the infiltration effects of several interacting parameters that are related to h sub s, including soil surface macroporosity and roughness, macropore space extent and continuity, antecedent soil air and water, surface wettability and water repellency, wetted surface area and shape, and surface crust and slope. (Visocky-ISWS)
W76-01854

SOIL-GEOMORPHIC RELATIONSHIPS IN A FIRST-ORDER VALLEY IN CENTRAL NEW YORK,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
W. E. Hanna, L. A. Daugherty, and R. W. Arnold.
Soil Science Society of America Proceedings, Vol 39, No 4, p 716-722, July-August 1975. 3 fig, 3 tab, 20 ref.

Descriptors: *Soils, *Geomorphology, *New York, Valleys, Watersheds(Basins), Glaciation, Terraces(Geologic), Solifluction, Stratigraphy, Soil profiles, Soil surveys, Soil types.
Identifiers: *Soil mapping, Fragiochrepts, Fragiaquepts, Dystochrepts, Periglacial, Soil morphology, Hillslope, Cirque-like basin, Valley bottom.

Morphologically the soils in Hemlock Creek watershed are related to geomorphic development since glaciation. Initial drift deposits covering the 75-ha area in south-central New York were modified by mass movement (solifluction) and then altered by fluvial aggradation-degradation under a periglacial environment and by erosion in more recent times. Eight soil profiles representative of the geomorphic components forming the watershed were evaluated. Fragiochrepts dominate the shoulder, backslope, and upper footslope components. They are also the major soils on congeliturbate terraces and on step-treds of the upper basin. Fragiaquepts are common on the lower footslope and toeslope components and also occur on portions of the step-treads of the cirque-like basin. Fragipans have formed in both glacial till and congeliturbate deposits, indicating a pedologic origin. Structural expression and density of the pans increase with a decrease in natural drainage in both deposits. Dystrochrepts are dominant soils on the summit and on the intermediate level fluvial terraces; entisols occur on the low level alluvial terraces. Pan formation was thought to be precluded by nearness of bedrock (less than 1 m) to the surface in the summit area and by matrix textures in the fluvial terraces. Stratigraphic changes that produce distinct discontinuities in fluvial terrace profiles were readily evident. Incipient stratification in congeliturbate deposits appeared to affect soil morphology, especially horizon thickness, in these relatively young soils. (Lee-ISWS)
W76-01855

MEASURING SOIL CREEP,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 7B.
W76-01856

SOME EFFECTS OF CADMIUM ON CONIFEROUS FOREST SOIL/LITTER MICROCOSMS,
National Ecological Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B.
W76-01862

WATER BALANCE STUDIES,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria). Div. of Atomic Energy in Food and Agriculture.
For primary bibliographic entry see Field 3F.
W76-01882

RADIATION EQUIPMENT AND THE PRINCIPLES INVOLVED IN ITS USE,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria), Div. of Atomic Energy in Food and Agriculture.
Y. Barrada.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm

Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 97-102, 1 tab, 8 ref.

Descriptors: *Soil moisture, *Nuclear moisture meters, *Moisture content, *Soil density probes, Soil water, Soil moisture meters, Instrumentation, Nuclear meters, Soil density, Soil physical properties, Soil surfaces, Radiation, Gamma rays.
Identifiers: *Gamma density probe.

The equipment consists of a probe containing the radiation source and a detector and electronic counter. Probes for soil moisture determination use a neutron source while those for density measurements contain a gamma source. The count rate indicated by the scaler or rate meter is used for reading the corresponding value of soil moisture or bulk density on a calibration chart. The different types of radiation equipment and the principles involved in their use that are discussed include (1) the neutron moisture meter, including the source, the detector, the design, and the resolution of the meter (2) the gamma density probe, (3) the two wells gamma probe, and (4) surface probes. (See also W76-01878) (Robinett-Arizona)
W76-01883

SURFACE IRRIGATION METHODS AND PRACTICES,
Food and Agriculture Organization of the United Nations, Cairo (Egypt). Near East Regional Office.
For primary bibliographic entry see Field 3F.
W76-01885

2H. Lakes

PUBLIC PRIORITIES FOR GREAT LAKES RESEARCH,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 5G.
W76-01515

THREE-DIMENSIONAL SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-01518

EVALUATION OF SATELLITE REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS AND COASTAL MARSHLANDS,
National Space Technology Lab. Bay St. Louis, Miss. Earth Resources Lab.
For primary bibliographic entry see Field 7B.
W76-01531

THE DYNAMICS OF NUTRIENT LIMITATION OF PHYTOPLANKTON ALGAE: A MODEL RECONSIDERED,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
W. J. O'Brien.
Ecology, Vol 55, No 1, p 135-141, 1974. Illus.

Descriptors: *Phytoplankton, Eutroplication, Nutrient requirements.

A model of phytoplankton nutrient dynamics similar to that proposed by Dugdale (1967) simulates the dynamics of phytoplankton-nutrient interactions in lakes. Phytoplankton population crashes similar to those commonly observed in spring phytoplankton blooms occur during simulation whenever large amounts of the limiting nutrient are initially provided. The model shows the phytoplankton death rate as an important influence on the steady state nutrient concentration and population density. Zooplankton grazing appears to be potentially important in triggering blue-green algal blooms and in maintaining high phytoplankton species diversity; phytoplankton mortality caused by settling may be a factor in the seasonal succession of plankton algae. Two potentially confounding factors-nutrient regeneration from dead cells and multiple limiting nutrients-are shown to have no significant effect on the properties of the model--Copyright 1974, Biological Abstracts, Inc.
W76-01540

SOLUTE BALANCE AT ABERT AND SUMMER LAKES, SOUTH-CENTRAL OREGON,
Geological Survey, Reston, Va.
A. S. VanDenburgh.
Available from Supt. of Documents, GPO, Wash., DC 20402 price $2.35. Professional Paper 502-C, 1975. 29 p, 14 fig, 1 plate, 10 tab, 24 ref.

Descriptors: *Dissolved solids, *Saline lakes, *Oregon, *Chemical analysis, *Hydrologic data, Impoundments, Inflow, Surface waters, Groundwater.
Identifiers: *Albert Lake(Oreg), *Summer Lake(Oreg), *Closed basins.

Neighboring Abert and Summer Lakes occupy the broad flat floors of deep, topographically enclosed basins in the high desert of south-central Oregon. The two saline lakes and their tributary areas provide contrasting hydrologic environments well suited to an investigation of the various aspects of solute economy. Exclusive of direct precipitation, Lake Albert received about 90 percent (62,000 acre-ft) of its average annual water supply from the snow-fed Chewaucan River. Summer Lake, in contrast, derives about 74 percent (67,000 acre-ft per year) of its inflow from Ana Springs via Ana River. Prior to impoundment of the river and inundation of the springs, the annual contribution averaged about 100,000 acre-feet (83 percent of the total). The Chewaucan River at its mouth carries an average of about 120 mg/litre of dissolved solids, whereas the flow of Ana Springs contains 160 mg/litre. The relation between incoming and stored solutes at the two lakes contrasts sharply. Total salts and chloride stored in Lake Albert and within the top 5 feet of bottom and playa sediments are, respectively, 8,000 and 16,000 times the average present-day income, whereas comparable values at Summer Lake are only about 1,000 and 2,000 (the higher values for chloride reflect its enrichment relative to carbonate and bicarbonate). (Woodward-USGS)
W76-01570

LAKES OF OREGON: VOLUME 3. HOOD RIVER, MULTNOMAH, WASHINGTON, AND YAMHILL COUNTIES,
Geological Survey, Portland, Oreg.
M. V. Shulters.
Open-file report, 1975. 93 p, 7 fig, 1 tab, 19 ref.

Descriptors: *Hydrologic data, *Water quality, *Lakes, *Reservoirs, *Oregon, Lake morphology, Chemical analysis, Water temperatures, Water utilization, Bathymetry, Contours.
Identifiers: *Hood River County(Oreg), *Multnomah County(Oreg), *Washington County(Oreg), *Yamhill County(Oreg).

This inventory of 61 lakes and reservoirs in Hood River, Multnomah, Washington, and Yamhill Counties, Oregon, includes data in hydrology, water quality, water use, and a bathymetric map for each lake. The report provides information for use by city, county, and State planning groups as well as for sportsmen, tourists, and others interested in preserving the recreational value of Oregon's lakes. In addition to office compilation of existing data, each lake was also visited. Most visits were made in summer or early fall when lakes were most accessible and when water temperature and biological activity were at a maximum. (See also W75-03968 and W74-06270) (Woodward-USGS)
W76-01579

AN INTRODUCTION TO THE PROCESSES, PROBLEMS, AND MANAGEMENT OF URBAN LAKES,
Geological Survey, Menlo Park, Calif.
L. J. Britton, R. C. Averett, and R. F. Ferreira.
Circular 601-K, 1975. 22 p, 6 fig, 1 tab, 50 ref.

Descriptors: *Lakes, *Water quality, *Water pollution sources, Reviews, Water pollution effects, Chemical properties, Physical properties, Biological properties, Thermal pollution, Eutrophication, Sedimentation, Water pollution control.
Identifiers: *Urban lakes, Lake management.

The multiple uses of lakes have made them susceptible to water-quality problems such as algal blooms, sediment deposition and fish kills. These problems are products of the eutrophication process (enrichment, aging and extinction of lakes), which is often accelerated by man. Therefore, it is important to understand the properties and processes of lakes which govern lake enrichment, and the measures available to control enrichment. Lakes are described in terms of their physical (light penetration, temperature, sediment, and morphology), chemical (chemical constituents, plant nutrients, and dissolved gases) and biological (plankton, benthos, and nekton) properties. These properties are all interrelated, and are important variables to evaluate water quality. In addition, lake processes, such as photosynthesis, respiration, eutrophication, and biogeochemical cycling, are important factors in determining the sources and extent of enrichment, and managing a lake for maximum benefit. (Woodard-USGS)
W76-01588

DEVELOPMENT AND ECOLOGY OF SKUJA IN THE SWEDISH LAKE TRUMMEN,
Lund Univ. (Sweden). Limnological Inst.
G. Cronberg.
Sven Bot Tidskr. Vol 67, No 1, p 59-64, 1973. Illus.

Descriptors: *Water pollution, *Lakes, Algae, Spores, *Reclamation, Europe.
Identifiers: Akinetes, Lake Trummen, Raphidiopsis-Mediterranea, Sweden, Skuja.

R. mediterranea was recorded for the first time in Sweden in Lake Trummen, a polluted lake which now is being restored. The alga was followed for several years. At its maximum development the alga occurred abundantly. It showed great seasonal variability and developed akinetes with spores. Earlier discrepancies on the morphology were apparently caused by differences in the state of development.--Copyright (c) 1974, Biological Abstracts, Inc.
W76-01621

THE ROLE OF AMINO ACIDS IN THE NITROGEN CYCLE OF LAKE MENDOTA,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W76-01654

NITROGEN, PHOSPHORUS AND CARBON CYCLES IN A DISTURBED EUTROPHIC ECOSYSTEM,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W76-01656

CHYDORID (CLADOCERA) ECOLOGY: SEASONAL PATTERNS AND ABUNDANCE OF POPULATIONS IN ELK LAKE, MINNESOTA,
Tennessee Univ., Knoxville. Dept. of Zoology.
M. C. Whiteside.
Ecology. Vol 55, No 3, p 538-550, 1974. Illus.

Descriptors: *Crustaceans, Aquatic populations, Distribution patterns.
Identifiers: Elk Lake(Minn).

Population dynamics of chydorids from Elk Lake, Minnesota (USA) were followed from May through Oct. 1971 by means of 3 collecting methods. Emphasis was placed on data obtained by use of artificial substrate. This method was found to collect most species of chydorids living in the underlying substrate. A 2nd method, funnel trapping, collected animals that migrated 10-20 cm vertically from their substrate into the funnel traps. Funnel trapping was found to be not very efficient at collecting all chydorid species, but to be useful for following overall population trends and for exploring the vertical movements of some species. A 3rd method, called pattern sampling, was tried experimentally. It appears to collect most chydorid species, and also shows the micro-distributions (or spatial arrangements) associated with population densities. Most chydorid species increase in population numbers during spring and fall, and decrease during midsummer. Chydorids have clumped or contagious patterns that fit the negative binomial distribution. A log/log relationship exists between estimates of the mean and variance over the sampling interval, May-October; this relationship established a relatively constant structural arrangement patterns as reflected by the exponent k of the negative binominal, and by b of Taylor's power law. There are several possible explanations for chydorid clumping-heterogeneous habitat, aggregation about food sources, predation, lack of dispersal and behavior. Future studies will be directed at evaluating the relationships between spatial patterns and population densities.--Copyright 1974, Biological Abstracts, Inc.
W76-01719

ZOOPLANKTON COMPETITION AND PREDATION: AN EXPERIMENTAL TEST OF THE SIZE-EFFICIENCY HYPOTHESIS,
Wisconsin Univ., Madison. Dept. of Zoology.
S. I. Dodson.
Ecology, Vol 55, No 3, p 605-613, 1974. Illus.

Descriptors: *Zooplankton, Competition, Predation.
Identifiers: Daphnia middendorffiana, Daphnia minnehaha, Diaptomus shoshone.

Twelve 42-l plankton cages were used in an alpine Colorado (USA) pond to test the size-efficiency hypothesis: to determine why small herbivorous zooplankton species tend not to coexist with large species. The size-efficiency hypothesis, that large species exclude the smaller ones through competition for food, was not substantiated. An alternate hypothesis extends the understanding of the importance of size-selective predators to include invertebrates selecting small prey. A predaceous copepod Diaptomus shoshone excluded the small Daphnia minnehaha from an association with the large D. middendorffiana within 1 mo. By implication, the predacious copepod is responsible for the absence of the small species in ponds occupied by the large Daphnia species.--Copyright 1974, Biological abstracts, Inc.
W76-01729

FRY DISTRIBUTION IN THE LOWER SVIYAGA BAY OF THE KUIBYSHEV RESERVOIR, (IN RUSSIAN),
Kazan State Univ., (USSR).
V. A. Kuznetsov.
Gidrobiol Zh. 9(5): 76-80 Illus. 1973.

Descriptors: *Bays, *Fry, Fish, Spawning, Fish reporduction.
Identifiers: Bleak, White bream, Bronze, Ide, Kuibyshev, Perch, Pike, Roach, Sviyaga Bay, USSR, Walleye, Zope.

The Sviyaga Bay of the Kuibyshev Reservoir (USSR) is a shallow body of water with an average depth of 3 m; depths to 20 m in individual areas of the former channel of the Sviyaga River. A study of the distribution of bronze bream, roach, ide, zope, white bream, bleak, pike, perch and walleye in the bay revealed that the fry concentrate mainly in places protected against the prevailing winds, where rich aquatic and littoral vegetation develops and zooplankton is more abundant than in open regions. In spring the utilization of the spawning grounds also depends on the character of the winds. The migration of fry from the shore at this time is related to a decrease in water level.--Copyright 1975, Biological Abstracts, Inc.
W76-01752

THE CHEMICAL COMPOSITION OF THE UPPER LAYER OF SAPROPEL FROM THE VIITNA LAKES, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
A. Lindpere.
Eesti Nsv Tead Akad Toim Biol. 23(4): 343-347. 1974. (Engl. summ).

Descriptors: *Chemical analysis, *Sediments, *Lakes.
Identifiers: Estonian-SSR, *Sapropel, Sparganium-Friesii, *USSR(Viitna Lakes).

The results of chemical analyses of 24 samples of sapropel collected at a depth of 0-20 cm from the lakes Viitna Linajarv and Viitna Pikkjarv in Estonia (USSR) are presented. The contents of ash, Si02, Ca0, Fe203, Al2O3, P205, K20 and Na20 are given. The contents of organic C, O, H and N and trace elements are given on the basis of a number of analyses. (Sparganium friesii was studied.)--Copyright 1975, Biological Abstracts, Inc.
W76-01753

THE EFFECT OF OZONE ON THE DISSOLVED ORGANIC SUBSTANCES IN THE WATER OF LAKE CONSTANCE (WIRKUNG VON OZON AUF DIE GELOESTEN ORGANISCHEN SUBSTANZEN IM BODENSEEWASSER),
For primary bibliographic entry see Field 5C.
W76-01760

PARTICIPATION OF MICROORGANISMS IN SULFUR TURNOVER IN POMIARETZKOE LAKE, (IN RUSSIAN),
Akademiya Nauk SSSS, Moscow. Institut Mikrobiologii.
For primary bibliographic entry see Field 5C.
W76-01774

WAVE HEIGHT INDICATOR LITERATURE SEARCH AND VENDOR SURVEY,
For primary bibliographic entry see Field 2L.
W76-01834

THE LONG-PERIOD INTERNAL WAVES IN LAKE BIWA,
Tokyo Univ. of Fisheries (Japan). Dept. of Marine Environmental Engineering.
S. Kanari.
Limnology and Oceanography, Vol 20, No 4, p 544-553, July 1975. 9 fig, 2 tab, 9 ref.

Descriptors: *Internal waves, *Thermal stratification, *Seiches, *Boundary processes, *Coriolis force, Wind velocity, Rotational flow, Temperature, Solar radiation, Numerical analysis, Model studies, Lakes.
Identifiers: *Lake Biwa(Japan), Spectral analysis.

Heating of the surface layer by solar radiation makes remarkable growth of the thermocline in Lake Biwa, the largest lake in Japan, during early summer to late autumn. The density distribution in the lake during the season of thermal stratification can be considered to approximate a two-layer structure. The problem of the effect of the earth's rotation on the long-period internal seiches in the lake was approached by use of a two-layered numerical model with 25 by 62 square meshes of 1-km intervals. It was assumed that a constant wind stress is suddenly imposed on the surface of the model lake that has no motion initially and that after a given duration the wind stress suddenly vanishes. The pattern of oscillations obtained from the numerical model was essentially the same as that in a two-layered rotating rectangular lake. Such rotatory behavior of the internal wave is consistent with the results of spectral analysis of temperature records. (Singh-ISWS)
W76-01845

2I. Water In Plants

AN INFORMATION RETRIEVAL SYSTEM FOR THE MACROINVERTEBRATE FAUNA OF INDIANA RIVERS AND LAKES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
W. P. McCafferty.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-139, $3.50 in paper copy, $2.25 in microfiche. Technical Report No 70, September 1975, 5 p. OWRT-A-041-IND(1).

Descriptors: *Systematics, *Baseline studies, Data storage and retrieval, *Indiana, *Information retrieval, Invertebrates, Lakes, Rivers, Data collections.
Identifiers: *Ephemeroptera, Broadhurst Uniterm system, Retrieval index, Retrieval systems.

Spatial, temporal, and micro-havitat data are associated with comprehensive benthic and terrestrial samples of Ephemeroptera from throughout Indiana taken over the past three and one-half years. Objectives were to implement a utilitarian index system to provide the needed capability of correlating available subsets of environmental data. This model would then be available for making biological predictions concerning environmental water quality. The system is unique since it utilizes the natural ecological distribution of an entire aquatic fauna for a broad geographic area. A storage and retrieval system was designed after the Broadhurst Uniterm System. Various modifications of this system were made in order to accomodate the ecological and taxonomic data for which it has not been used previously. This system essentially consists of (1) the samples; (2) the accession index: and (3) the uniterm retrieval index. All information is completely cross referenced in the system. The system is open ended so that any new categories or information can be incorporated at any time. The model initially consists of 1,571 separate Indiana accessions and over 880 separate data uniterms within 17 categories and with an average of 91 references per uniterm for a total of over 80,000 accession numbers or reference inputs.
W76-01513

A MODEL OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS FIR FOREST FLOOR,
Minnesota Univ., Minneapolis. Dept. of Ecology and Behavioral Biology.
J. G. McColl.
Ecology, Vol 54, No 1, p 181-187, 1973. Illus.

Descriptors: *Ion transport, Forest soils, *Douglas fir trees, Microenvironment.
Identifiers: Pseudotsuga Menziesii.

The electrical conductivity and flow-rate of solution in a forest floor were continuously monitored in the field using a tension-lysimeter system coupled with automated recording instruments. Forest floor temperature was also automatically recorded. The field study site was in a uniform 2nd-growth Douglas-fir (Pseudotsuga menzeisii) forest on a glacial outwash soil in western Washington. Total ion amounts released from the forest floor during the movement of individual wetting fronts resulting from natural precipitation were calculated. These field data, together with data obtained in the laboratory, were used to develop a model of the transport process. Over the temperature range experienced in the field, I, which is the total ion amount transport by given total flow of solution, can be described by the algebraic model: $I=M/1+A \exp(-BT)$, $(0C<T<20C)$ where M is the maximum ion amount transported by the given flow, T is the mean temperature of the dry period preceding flow, and A and B are constants. Values of M, A and B are also given for total flows up to 26 mm, so that I can be calculated for any combination of flow and temperature.--Copyright 1973, Biological Abstracts, Inc.
W76-01613

THE MIGRATION OF FLY LARVAE (SIMULIIDAE) IN WATER WITH HIGH LEVELS OF TURBIDITY(IN RUSSIAN).
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
M. T. Shternbergs.
Latv Psr Zinat Akad Vestis. 1 p 28-31, 1973.

Descriptors: Insects, *Larvae, *Migration, *Turbidity currents, Rivers, *Migration patterns, Pollutants, Water pollution effects.
Identifiers: Fly larvae, Odagmia-Ornata, Simuliidae, Simulium-Argyreatum, USSR.

The migration of fly larvae in the Ligupit River of the Latvian SSR (USSR) involved 89% Simulium argyreatum and 11% Odagmia ornata. Under normal conditions the migration rate was considerably lower at night than in the day. Less larvae were found migrating in the bottom layer and on the surface. The majority travelled 2.5-12.5m. As turbidity increased, the migration rate increased substantially. Under turbid conditions most larvae migrated 10-22.5m. In the bottom layer, the rate did not increase. O. ornata comprised 3.6% of the migrating larvae in turbid water due to its greater ecological plasticity. Adaptability was a factor in its widespread distribution and presence in polluted waters.--Copyright 1974, Biological Abstracts, Inc.
W76-01615

SURFACE ALBEDO AND DESERTIFICATION,
Agricultural Research Service, Water Conservation Lab. Phoenix, Ariz.
For primary bibliographic entry see Field 2B.
W76-01705

RELATIONSHIPS BETWEEN SELECTED PHYSICAL PARAMETERS AND BENTHIC COMMUNITY STRUCTURE IN A SMALL MOUNTAIN STREAM,
Wyoming Univ., Laramie. Water Resources Research Inst.
L. A. Kimble, and T. A. Wesche.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 416, $4.50 in paper copy, $2.25 in microfiche. Water Resources Series No 55, March 1975. 65 p, 18 tab, 13 fig, 26 ref, append. OWRT B-023-WYO(3). 14-31-0001-4143.

Descriptors: *Streams, *Benthos, *Benthic fauna, *Biological communities, Biomass, Aquatic habitats, Depth, Velocity, *Wyoming.

The benthic community present in a stream is dependent upon or regulated by chemical, biological, and physical factors. Three important physical factors which can influence the composition of benthic organisms are substrate, water velocity, and water depth. Four different substrates in a small Wyoming mountain stream were compared as to benthic community structure. The substrate types sampled were silt, sand and fine gravel, coarse gravel, and rubble. Highest mean number and mean biomass were found in the samples taken in rubble. Point and mean velocities also were measured for each sample taken. Greatest mean number and mean biomass were found at mean velocities of 0.50 foot-per-second (0.152 meter-per-second) or higher. Mean depth data indicated a preference by benthic organisms for depths of less than one foot (0.305 meter).
W76-01803

ROOT DEPTH AS A SENSITIVE PARAMETER IN A DETERMINISTIC HYDROLOGIC MODEL,
Agricultural Research Service, Beltsville Md. Hydrograph Lab.; and Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
C. B. England.
Water Resources Bulletin, Vol 11, No 5, p 1046-1051, October 1975. 4 fig, 14 ref.

Descriptors: *Root zone, *Depth, *Model studies, *Hydrologic aspects, *Root development, Parametric hydrology, Hydrologic data, Watersheds(Basins), Evaporation, Transpiration, Soil moisture, Lysimeters, Groundwater, Percolation, Soil water movement, Pores, Gravitational water, Evaporation pans, Air temperature, Bromegrass, Alfalfa.
Identifiers: *Muskingham silt loam, USDAHL-74 watershed hydrology model, Breakpoint precipitation.

Deterministic models of watershed hydrology require accurate a priori estimates of soil, vegetation, and watershed parameters. Physical fidelity of these values to those of the prototype natural watershed is essential. One vegetation parameter most neglected is plant root activity. Plant roots directly or indirectly affect many hydrologic processes, including evaporation, transpiration, soil moisture, and ground water. One of their more inportant functions is in opening surface- connected hydraulic pathways for rainfall penetration. Numerical trials of computing evapotranspiration and percolation from a 96-inch-deep lysimeter continuously cropped to bromegrass-alfalfa were conducted, using the USDAHL-74 Model of Watershed Hydrology. Comparisons of computed versus observed values indicated that the alfalfa roots had penetrated, or at least were withdrawing water from, the full depth of the lysimeter. The results illustrated the adaptability of the watershed model to soil moisture accounting, its sensitivity to the root depth parameter, and the need for rational determination of input parameters. (Visocky-ISWS)
W76-01846

A STUDY OF LAGOONAL AND ESTUARINE PROCESSES IN THE AREA OF MERRITT ISLAND ENCOMPASSING THE SPACE CENTER--ANNUAL REPORT, 1 JUL. 1973--31 AUG. 1974.
Florida Inst. of Tech., Melbourne.
For primary bibliographic entry see Field 2L.
W76-01893

EFFECTS OF QUALITY AND QUANTITY OF FOOD ON GOLDEN SHINER, NOTEMIGONUS CRYSOLEUCAS, PRODUCTION,
Arkansas Univ., Fayetteville. Dept. of Zoology.
R. V. Kilambi, and R. B. Roseberg.
Available from the National Technical Information Service Springfield, Va 22161 as COM-74-11143, $4.50 in paper copy, $2.25 in microfiche. Final Report to Arkansas Game and Fish Commission for Research Project 2-162-R, p 1-54, 1974, 3 fig, 9 tab, 27 ref.

Descriptors: *Fish physiology, *Growth rates, *Temperature, *Commercial fish, *Nutrient requirements, Fish diets, Density, Arkansas.
Identifiers: *Golden Shiner, Notemigonus crysoleucas.

The effects of quality of food (protein level) and stocking density on growth and temperature tolerance on production of golden shiner, Notemigonus crysoleucas were investigated. The best growth was achieved at the least dense 20 fish per 60 gallons and 38% protein feed condition. Temperature tolerance tests showed no consistent differences between any conditions except at 36 fish at 28% protein level condition. (Klein)
W76-01900

BIBLIOGRAPHY ON NUTRITIONAL REQUIREMENTS OF WARM WATER FISHES (BIBLIOGRAPHIE SUR LES BESOINS NUTRITIFS DES POISSONS VIVANT EN EAUX CHAUDES),
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station; and Ministry of Agriculture, Dor (Israel). Dept. of Fisheries.
B. Hepher, and J-L. Gaudet.
European Inland Fisheries Advisory Commission, Occasional Paper No 10, Food and Agriculture Organization of the United Nations, Rome 1975. 87 p, 1000 ref.

Descriptors: *Bibliographies, Publications, *Fish food organisms, *Nutrient requirements, *Fish management, *Fish diets, *Warm-water fish, Essential nutrients, Fish farming, Freshwater fish, Nutrients.

This bibliography on the nutritional requirements of warm water fish was prepared at the request of the EIFAC workshop on Fish Feed Technology and Nutrition. (Katz)
W76-01915

PINE ASSOCIATIONS OF THE DERNOVICH STRETCH OF THE PRIPYAT RIVER FLOODPLAIN, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralyn Botanichny Sad.
V. N. Kisyalyev, K. D. Chubanav, A. V. Bortnik, A. V. Zavryyev, and V. V. Ihnatsyenka.
Vyestsi Akad Navuk B SSR Syer Biyal Navuk, Vol 2, p 18-23, 1974. Illus.

Descriptors: Forests, *Coniferous forests, *Pine trees, *Flood plains, Rivers, *Geomorphology, *Hydrologic properties, *Soils.
Identifiers: Dernovich, Pripyat River, USSR.

A study of the geobotanical characteristics of the pine forests on the Dernovich stretch of the Pripyat River floodplain (USSR) revealed 3 associations of floodplain pine forests: Pinetum cytisio-pleurozioso-fluvialis, Pinetum pleuroziosofluvialis and Pinetum cytisio-graminoso-fluvialis. The edaphic, geomorphologic and hydrologic characteristics of the floodplain pine forests are presented.--Copyright 1975, Biological Abstracts, Inc.
W76-01918

EFFECT OF WATER MOVEMENT ON VIABILITY OF MICROCYSTIS AERUGINOSA KUTZ. EMEND. ELENK, (IN RUSSIAN),
Akademiya Nauk USSR, Kiev. Instytut Hidrobiologii.
V. I. Bykovskii.
Gidrobiol Zh, Vol 10, No 4, p 43-47, 1974. Illus. (English summary).

Descriptors: *Physiological ecology, Population, Aquatic populations.
Identifiers: *Microcystis-aeruginosa.

Changes in water velocity evoke changes in the number and survival rate of Microcystis colonies. Possible ways to increase the number of the colonies and to change their physiological state are considered.--Copyright 1975, Biological Abstracts, Inc.
W76-01919

2J. Erosion and Sedimentation

EVALUATING IRREGULAR SLOPES FOR SOIL LOSS PREDICTION,
Purdue Univ., Lafayette, Ind.
G. R. Foster, and W. H. Wischmeier.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 17, N0 2., p 305-309, March-April 1974. 3 fig, 8 ref.

Descriptors: *Soil erosion, Soil management, Soil conservation, Erosion, Slope stability, Topography, Evaluation, Agriculture, Construction, *Slopes, Degradation(Slope).
Identifiers: Soil erosion prediction.

The effects of slope irregularities on soil erosion by water were analyzed on the basis of recent progress in mathematical simulation of the basic erosion processes. This report presents the analysis and extends it to routine field application. A technique is proposed for evaluating the universal soil-loss equation's topographic factor, LS, for irregular field or construction-site slopes. The technique also provides a means of evaluating the effects of differences in soil erodibility that may be associated with changes in slope steepness. It does not, however, predict deposition that may occur on a slope. Irregular slopes are not accurately evaluated by using average values for slope steepness and soil erodibility in combination with overall length, and additional very helpful detail can be readily obtained. The proposed technique has direct application value both on farmland and on construction sites. (Skogerboe-Colorado State)
W76-01567

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-01577

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES. LEG 15,
Woods Hole Oceanographic Institution, Mass.
F. L. Sayles, F. T. Manheim, and L. S. Waterman.
In: Initial Reports of the Deep Sea Drilling Project, Volume 20, National Science Foundation, p 783-804, 1973; Washington, D.C. US Government Printing Office. 22 p, 2 fig, 9 tab, 15 ref.

Descriptors: *Connate water, *Sediments, *Chemical analysis, *Pore water, Bottom sediments, Oceans, Core drilling, Analytical techniques, Inorganic compounds, Geochemistry, Temperature.
Identifiers: *Caribbean Sea, Squeezing.

Major and some minor chemical constituents were studied in pore fluids of 123 samples from three drill sites in the Caribbean Sea. Site 147 (Cariaco Basin) yielded pore fluids resembling those from other clayey and rapidly deposited sediment accumulations near shore. Strong depletions in SO4 and substantial depletions in K, Ca, and Mg accompany increases in alkalinity. Toward the bottom of the site, a decrease in the normally 'conservative' (i.e. unreactive) constituents, Na and Cl, reached nearly 10% of about 180 meters depth. The cause of this apparent dilution is still unknown, but it resembles similar dilutions found in other rapidly deposited sediment pockets influenced by proximity to continental masses. At Sites 147, 148, and 149 concentration changes of Ca, Mg, K, HCO3, and SO4 in most samples are compatible with a reaction model based on sulfate reduction, uptake of magnesium on clays, and precipitation of carbonates. The temperature of squeezing affects cation results in all sites. Greatest relative influence of temperature of squeezing occurred for boron, with nearly +50 percent increase in clayey-marly strata. In contrast to previous expectations, temperature-related anomalies were only slightly lower for highly calcareous sediments such as chalks than for sediments described as clays and marls. (Woodard-USGS)
W76-01581

MERCURY DISTRIBUTION IN ANCIENT AND MODERN SEDIMENT OF NORTHEASTERN BERING SEA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-01586

HEAVY METAL (CU, PB, ZN, CD, NI, AS, HG) ADDITIONS TO SURFACE WATERS, STREAMS SEDIMENTS AND SELECTED AQUATIC LIFE IN THE MERAMEC PARK RESERVOIR DRAINAGE BASIN, MISSOURI,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W76-01686

A CLOSE-INTERVAL FRACTIONATOR FOR SEDIMENT CORES,
Union Carbide Corp., Tarrytown, N.Y. Environmental Science Program.
A. Fast, and R. G. Wetzel.
Ecology, Vol 55, No 1, p 202-204. 1974. Illus.

Descriptors: *Cores, Core logging, Sampling, Sediments.

Extrusion and fractionation are necessary steps for most sediment core analyses. A new device that rapidly fractionates the core sample as it is extruded from the core tube was designed. The fractionator works well with consolidated or fluid sediments. Results indicate that the fractionator gives representative samples with little or no vertical contamination of the core sample.--Copyright 1974, Biological Abstracts, Inc.
W76-01720

THE SHORT TERM VARIATION IN SUSPENDED SEDIMENT CONCENTRATION CAUSED BY THE PASSAGE OF A BOAT WAVE OVER A TIDAL FLAT ENVIRONMENT,
New Hampshire Univ., Durham. Dept. of Earth Sciences; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
For primary bibliographic entry see Field 2L.
W76-01827

EROSION EVALUATION STUDY,
Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
S. M. Law, and S. J. Vaccaro.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 875, $5.00 in paper copy, $2.25 in microfiche. Research Report 76, June 1974. 70 p, 32 fig, 8 tab, 17 ref, append.

Descriptors: *Erosion, *Erosion control, *Laboratory tests, *On-site investigations, Cover crops, Vegetation establishment, Slopes, Embankments, Erosion rates, Rainfall, Rainfall simulators, Simulated rainfall, Mulching, *Louisiana.

New erosion products, such as mulches or chemical additives for retarding soil erosion or promoting grass stand growth, are evaluated each year. The study attempted to develop a laboratory procedure by which these products can be evaluated, as quickly as possible after they appear on the market, in order to screen them so that the best one can be further tested in the field. In the field phase, the products available were installed on selected test slopes in north Louisiana and observed. In the laboratory phase, the products were installed on plots containing grass seed and fertilizer and observed to obtain seed germination data, and on soil in test pans and tested under a rainfall-simulator to get some comparative soil loss data. Wood fiber mulches and chemical soil binders or erosion retardants were used. The principal factors affecting the results obtained in the field were the weather conditions; the size, shape, and steepness of the slopes; and the types of soil present. Reports and data dealing with the construction and operation of rainfall-simulators, erosion results from other studies, and other pertinent information were reviewed. An evaluation of the various pieces of equipment or parts of equipment relating to rainfall-simulators was undertaken also. The construction details to the rainfall-simulator developed were presented in an appendix. (Sims-ISWS)
W76-01829

HYDRAULIC CONSTANTS OF TIDAL ENTRANCES, II: STABILITY OF LONG ISLAND INLETS,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W76-01836

SOIL-GEOMORPHIC RELATIONSHIPS IN A FIRST-ORDER VALLEY IN CENTRAL NEW YORK,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-01855

2K. Chemical Processes

SOLUTE BALANCE AT ABERT AND SUMMER LAKES, SOUTH-CENTRAL OREGON,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2H.
W76-01570

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
Available from Superintendent of Documents, GPO, Washington, DC, 20402, price $2.85 in paper cover. Water-Supply Paper 2143, 1974. 371 p, 1 fig, 40 ref.

Descriptors: *Water quality, *Surface water, *Sediment transport, *Water temperatures, *Ohio River, River basins, Basic data collections, Alabama, Georgia, Indiana, Kentucky, Maryland, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Physical properties, Sampling, Chemical analysis, Inorganic compounds, Biological properties, Streamflow.
Identifiers: *Ohio River basin.

During the water year ending September 30, 1969, the Geological Survey maintained 152 stations on 95 streams in the Ohio River basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 92 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 74 and daily at 40 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were

taken at about the same time each day. Quantities of suspended sediment are reported for 18 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 14 stations. The stream discharges reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharge reported in the tables of single analyses are either daily mean discharges. or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodward-USGS)
W76-01577

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES. LEG 15,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2J.
W76-01581

GROUND WATER IN SELECTED AREAS IN THE KLAMATH BASIN, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2F.
W76-01590

ELECTROCHEMICAL DETECTION OF NH4 PLUS NH3 SYSTEMS IN WATER,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W76-01652

DISPERSION AS AN INDEX OF RELATIVE HYDRAULIC CONDUCTIVITY IN SALT-AFFECTED SOILS OF THE SUDAN,
Khartoum Univ., Khartoum (Sudan). Dept. of Biochemistry and Soil Science.
For primary bibliographic entry see Field 2G.
W76-01694

STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY AND TEMPERATURES,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
L. C. Murdock.
U.S. Patent No. 3,906,354, 7 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1371, September 16, 1975.

Descriptors: *Patents, Water properties, *Salinity, *Temperature, *Conductivity, *Water quality, *Sea water, Equipment, Measurement.
Identifiers: Sensors.

The instrument utilizes two conductivity cells, one cell being adapted for measuring the conductivity of the water environment acting on the cell, and a second cell which is a standard cell for measuring the conductivity of a standard sample of water of known salinity. The ratio of the conductivity measurements of the two cells is an indication of salinity. An output signal is obtained which is proportional to the conductivity ratio and this output signal is conveyed to a remote location such as by a wire link communication. In a preferred construction, first and second electrically insulative members having spaced apart portions take the form of first and second thin wall concentric cylinders. A standard sample of electrically conducting liquid of a known predetermined parameter is contained between the two cyclinders. In order to make electrical contact with the standard seawater, first and second electrodes are provided which are supported by the cylinders and which are in electrical contact with the standard sample. The cylinders are of a size to permit rapid heat transfer to the standard sample, while still maintaining high mechanical strength. With a known relationship between conductivity and temperature, a reading of the conductivity of the standard cell gives an indication of temperature. Thus an extremely rapid thermister or temperature sensor is provided. (Sinha-OEIS)
W76-01716

THE CHEMICAL COMPOSITION OF THE UPPER LAYER OF SAPROPEL FROM THE VIITNA LAKES, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
For primary bibliographic entry see Field 2H.
W76-01753

USE OF TEST WELLS AS WATER-QUALITY PREDICTIONS,
Wisconsin Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W76-01768

EXTRACTION OF INFORMATION ON INORGANIC WATER QUALITY,
Bureau of Reclamation, Denver, Col. Water Quality Office.
For primary bibliographic entry see Field 5A.
W76-01844

2L. Estuaries

CHEMICAL AND SEDIMENT BUDGETS FOR A SMALL TIDAL CREEK, CHARLESTON HARBOR, S. C.,
South Carolina Univ., Columbus. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-01511

PLANNING FOR COASTAL RECREATION OPPORTUNITIES NEAR LARGE URBAN AREAS: A STUDY RELATING TRANSPORTATION AND RECREATION,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W76-01516

EVALUATION OF SATELLITE REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS AND COASTAL MARSHLANDS,
National Space Technology Lab. Bay St. Louis, Miss. Earth Resources Lab.
For primary bibliographic entry see Field 7B.
W76-01531

SATELLITE RFLAY AND PROCESSING OF HYDROLOGIC DATA IN SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7B.
W76-01578

GENERAL MODEL TO SIMULATE FLOW IN BRANCHED ESTUARIES,
Geological Survey, Reston, Va.
J. P. Bennett.
Reprint from Proceedings of the Symposium on Modeling Techniques, held at San Francisco, Calif, September 3-5, 1975: American Society of Civil Engineers, p 643-662, 1975. 4 fig, 5 tab, 8 ref.

Descriptors: *Model studies, *Tidal streams, *Estuaries, *Discharge(Water), *Streamflow, forecasting, Computer models, Methodology, Input-output analysis, Channel flow, Correlation anaylsis, Columbia River, *Oregon.
Identifiers: *Willamette River(Oreg).

The model simulated the time history of stage and discharge in any estuary that can be idealized as a system of interconnected one-dimensional open channels. A unique coding system included in the model input as a part of the description of each cross-section enables the solution algorithm to treat any network of channels without modification of Fortran coding. There are no restrictions as to the number of reaches or junctions that can be considered because the algorithm computes stage and discharge for each cross-section without reference to its location in a particular channel reach or at a junction. Application of the model is illustrated using an extensive data base collected in the Portland, Oregon, harbor on the Willamette and Columbia Rivers. The harbor is idealized as a set of seven interconnected one-dimensional channels. After calibration, the model reproduces observed stages to within a RMS error of 0.2 ft, and discharges to within a RMS error of less than 50 percent of the average absolute value. (Woodward-USGS)
W76-01580

STRATIGRAPHY OF ATLANTIC COASTAL MARGIN OF UNITED STATES NORTH OF CAPE HATTERAS--BRIEF SURVEY,
Geological Survey, Reston, Va.
W. J. Perry, Jr., J. P. Minard, E. G. A. Weed, E. I. Robbins, and E. C. Rhodehamel.
American Association of Petroleum Geologists Bulletin, Vol 59, No 9, p 1529-1548, September 1975. 12 fig, 58 ref.

Descriptors: *Stratigraphy, *Continental shelf, *Northeast US, *Sediment distribution, Geology, Geologic time, Hydrogeology, Oil reservoirs, Sedimentology.
Identifiers: *Hydrocarbons, *Oil potential.

A synthesis of studies of sea-floor outcrops of the sedimentary wedge beneath the northeastern United States continental shelf and slope and a reassessment of coastal plain Mesozoic stratigraphy, particularly of the coastal margin, provide insight for estimating the oil and gas potential and provide geologic control for marine seismic investigations of the Atlantic continental margin. The oldest strata known to crop out on the continental slope are late Campanian in age. The Cretaceous-Tertiary contact along the slope ranges from a water depth of 0.6 to 1.5 km south of Georges Bank to 1.8 km in Hudson Canyon. Few samples are available from Tertiary and Late Cretaceous outcrops along the slope. Mesozoic correlations in coastal wells between coastal Virginia and Long Island have been revised. The Upper-Lower Cretaceous boundary is placed at the transition between Albian and Cenomanian floras. Potential hydrocarbon source beds are present along the coast in the subsurface sediments of Cretaceous age. Potential reservoir sandstones are abundant in this sequence. (Woodard-USGS)
W76-01583

MERCURY DISTRIBUTION IN ANCIENT AND MODERN SEDIMENT OF NORTHEASTERN BERING SEA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-01586

A WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY BASIN, PART 1.
For primary bibliographic entry see Field 5G.
W76-01593

A WATER QUALITY CONTROL PLAN FOR SAN FRANCISCO BAY BASIN, PART 2.
For primary bibliographic entry see Field 5G.
W76-01594

A STUDY OF LAGOONAL AND ESTUARINE PROCESSES IN THE AREA OF MERRITT

ISLAND ENCOMPASSING THE SPACE CENTER.
Florida Institute of Tech., Melbourne.
Annual Report July 1972-August 1974. 69 p. (NASA-CR-140601). NGR 10-015-008.

Descriptors: *Estuaries, *Lagoons, Biological communities, *Florida, Systematics, Benthic fauna, Marine bacteria, Nutrients, Winds, Subtropic, Currents(Water), Bottom sediments, Water quality, Water circulation.
Identifiers: *Kennedy Space Center(Fla), *Haulover Canal(Fla), Indian River(Fla), Banana River(Fla), Merritt Island(Fla), Mosquito Lagoon(Fla).

The study of lagoonal and estuarine ecological processes in the vicinity of the John F. Kennedy Space Center on Merritt Island, Florida is described. The island is located at the apex of the three principal components of the lagoonal complex of east central Florida: the Indian River Lagoon (formerly Mosquito Lagoon), the Indian River, and the Banana River. All the waters are saline and near classical examples of lagoons; but in some areas there is an influx of fresh water and the lagoons have an estuarine character. The findings are reported in separate chapters as biological sampling, microbiological studies, physical aspects, sediment analysis, and water quality parameters. The appendix includes a condensation of a thesis by Richard Evan Dill on the circulation in the lagoons around the Kennedy Space Center and condensation of a thesis by David Richard Browne on the transport of water through the Haulover Canal. (Buchanan-Davidson--Wisconsin)
W76-01657

OBSERVATIONS ON THE ASSOCIATION BETWEEN MERCURY AND ORGANIC MATTER DISSOLVED IN NATURAL WATERS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W76-01757

CLASSIFICATION OF MODELS TO TIDAL WATERS,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W76-01780

CYCLIC STORAGE OF FRESH WATER IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 4B.
W76-01811

THE SHORT TERM VARIATION IN SUSPENDED SEDIMENT CONCENTRATION CAUSED BY THE PASSAGE OF A BOAT WAVE OVER A TIDAL FLAT ENVIRONMENT,
New Hampshire Univ., Durham. Dept. of Earth Sciences; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
F. E. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-003 549, $4.00 in paper copy, $2.25 in microfiche. Technical Report No 2, February 1974. 45 p, 10 fig, 2 tab, 33 ref. ONR N00014-67-A-0158-0007.

Descriptors: *Estuaries, *Tidal marshes, *Waves(Water), *Suspended solids, Tidal waters, Shallow water, Mud flats, Coastal marshes, Boats, Sediments, Erosion, On-site investigations.
Identifiers: *Boat waves.

A series of boat waves were directed across the tidal flat at varying water depths to compare the different amounts of wave energy expended in each area of the tidal flat and to examine the post-boat wave effects on sediment resuspension and deposition. In general, the outer portion (near low tide mark) of the tidal flat received between one third and one half more wave energy than the shallow region. There was a great deal of energy lost through bottom friction as the wave form passed through shallow water. Because of this energy gradient, the outer portion of the tidal flat appeared to be the most dynamic with alternate periods of resuspension and deposition. In contrast, the inner area was primarily depositional. Near the low tide mark, sediments were easily resuspended--yet just as easily deposited. Their apparent high deposition rates were anomalous for the bottom sediments of the area and it was inferred the sediment particles were behaving more like low density aggregates rather than individual grains of silt or clay. The source of these aggregates may be local pelletization by benthic fauna or physical aggregation caused by reworking of the bottom sediments by waves. (Sims-ISWS)
W76-01827

WAVE HEIGHT INDICATOR LITERATURE SEARCH AND VENDOR SURVEY,
H. Carleton.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-74 11788, $3.50 in paper copy, $2.25 in microfiche. National Maritime Research Center, Kings Point, New York, Report NMRC-KP-123, May 1974. 18 p, 6 fig, 23 ref, 1 append. NMRC MA2-4178.

Descriptors: *Waves(Water), *Ocean waves, *Measurement, *Instrumentation, Equipment, Buoys, Oceans, Lakes, Winds, Sampling, On-site investigations, Ships, Weather data, Oceanography.
Identifiers: *Wave height indicators, Wave meters, Wave followers, Deep sea wave meters, Shipborne wave meters.

Heavy weather encountered by ships has resulted in ship and cargo damage, loss of time and many times loss of life. To minimize the adverse effects of heavy weather, ships can reduce speed and change course based on information provided by weather service or routing service organizations. Information provided by these services is derived from observations made by a wide variety of weather stations, including merchant and naval vessels. The data provided by these vessels should be as accurate as the state of the art and financial considerations will allow. Most of the weather data provided by ship observers is generally well instrumented except for the measurement sea state. Wave height and period are visual observations that are difficult to make and have proven to be very inaccurate. It is felt that instrumentation should be provided aboard merchant vessels so that these important parameters can be measured and reported with greater accuracy, especially when heavy weather is encountered. The results of a limited literature search into wave meters that are used aboard ships to observe wave height and wave spectra was reported. Also included was a review of some literature that is available on commercial wave meters that are applicable for use by ships in measuring wave height. (Sims-ISWS)
W76-01834

HYDRAULIC CONSTANTS OF TIDAL ENTRANCES, II: STABILITY OF LONG ISLAND INLETS,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
A. J. Mehta, and H. S. Hou.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-004 992, $5.50 in paper copy, $2.25 in microfiche. Technical Report No 23, November 1974. 96 p, 26 fig, 11 tab, 37 ref, 1 append. ONR NR-388-106 ONR N00014-68-A-0173-0020.

Descriptors: *Estuaries, *Tidal effects, *Hydraulics, *Stability, Littoral drift, Scour, Inlets(Waterways), Sediment transport, Channels, *New York.
Identifiers: *Tidal inlets, *Long Island(NY).

The report presented the results of an office study related to the susceptibility of a tidal inlet because of the closure of its mouth. The specific examples explored were the inlets on the south shore of Long Island. The closure of an inlet involves a consideration of two opposing agencies, namely: (1) the onshore wave energy which tends to drive littoral materials toward the entrance, and (2) the tidal flow which attempts to scour this material, helping to keep the entrance channel open. These concepts were applied for hypothetical closing of Long Island inlets. A generalized criterion for stability was proposed, and it was found that this criterion could be used to classify inlest ranging in size from a laboratory model to large natural entrances. (See also W74-12648) (Bhownik-ISWS)
W76-01836

REMOTE SENSING APPLICATIONS IN MARINE SCIENCE PROGRAMS AT VIMS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 7B.
W76-01839

BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W76-01842

THE DISTRIBUTION OF EXCESS TEMPERATURE FROM THE VIENNA GENERATING STATION ON THE NANTICOKE RIVER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 5B.
W76-01843

A STUDY OF LAGOONAL AND ESTUARINE PROCESSES IN THE AREA OF MERRITT ISLAND ENCOMPASSING THE SPACE CENTER--ANNUAL REPORT, 1 JUL. 1973--31 AUG. 1974.
Florida Inst. of Tech., Melbourne.
Available from the National Technical Information Service Springfield, Va 22161 as PB10670, $4.50 in paper copy, $2.25 in microfiche. NASA-CR-140601; AR-2, 31 Aug. 1974, 69 p. NGR-10-015-008.

Descriptors: *Estuaries, *Estuarine environment, *Florida, *Lagoons, Marine animals, Microorganisms, Biological communities, Water quality, Bottom sediments, *Systematics.
Identifiers: *Kennedy Space Center(Fla), *Merritt Island(Fla), Indian River(Fla).

A study was conducted to determine the marine biology and dynamic oceanographic properties of the Indian River in Florida. One of the major areas of concentration involved the compilation of a taxonomic list of marine animals in the river. An important conclusion of the study is that diversity of the benthic community is substantially higher than expected. The effect of major climatic factors on the diversity and structure of the benthic community is analyzed. (See also W76-01894 thru W76-01898).
W76-01893

BIOLOGICAL SAMPLING OF THE LAGOONAL COMPLEX SURROUNDING KSC (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
K. B. Clark, and J. Thomas.

In: A Study of Lagoonal and Estuarine Processes in the Area of Merritt Island Encompassing the Space Center, Annual Report July 1972-August 1974, p I-1--I-15. 3 fig, 4 tab, 4 ref. (NASA CR-140601). NASA NGR 10-015-008.

Descriptors: *Biological communities, *Estuaries, *Lagoons, Florida, Systematics, Marine animals, Benthic fauna, Invertebrates, Periphyton, Varieties, Oxidation-reduction potential, Anaerobic conditions.
Identifiers: Kennedy Space Center(Fla), Merritt Island(Fla), Indian River(Fla).

A 1974 taxonomic list of marine animals in the Indian River, Florida, showed that diversity of the benthic community was higher than expected. Salinity eliminated certain major tax such as echinoids, asteroids, and scaphopods. Ninety species were present in benthic grab samples. About 45% of the invertebrate species had boreal or Carolinean geographic affinites, while other Florida environments have predominantly Antillean affinites. There were 23 species of larger invertebrates, those on rock substrates, aufwuchs species, and rare specimens not collected by the grab samples. Aufwuchs species are seasonal, thus the total number of species should increase when seasonal studies are completed. Depth, redox potential, organic carbon, presence of rooted vegetation, and sediment significantly affect diversity and community structure. Sediment redox potential can be used to indicate long-term oxygen availability relative to availability of organic matter in marine sediments. Anaerobic conditions occur nocturnally in shallow areas and may kill some invertebrates, thus limiting species richness. Significant correlation exists between redox potential and diversity in samples in grass-free areas. Two communities were present: the first was a shallow water community dominated by Diplanthera and Cymodoceum, and the second was less defined. The species occurring are listed. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01894

MICROBIOLOGICAL STUDIES OF THE LAGOONAL COMPLEX SURROUNDING KSC (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
T. A. Nevin, W. L. Blevins, and C. Noble.
In: A Study of Lagoonal and Estuarine Processes in the Area of Merritt Island Encompassing the Space Center, Annual Report July 1973-August 1974, p II-1--II-11. 5 tab, 9 ref. (NASA CR-140601). NASA NGR 10-015-008.

Descriptors: *Estuaries, *Lagoons, Florida, *Microorganisms, *Marine bacteria, Aerobic conditions, Anaerobic conditions, Hydrogen sulfide, Sulfur compounds, Inhibitors, Nutrient requirements.
Identifiers: Kennedy Space Center(Fla), Merritt Island(Fla).

Activities of the marine type halophilic microorganisms indigenous to, or adventitiously present in waters adjacent to the Kennedy Space Center, Florida, were studied. When lagoonal water was enriched with nutrient broth and incubated under aerobic conditions, what appeared to be hydrogen sulfide was produced. Experiments indicated that the reactive substance was probably a thiol (mercaptan). Bacterial growth occurred when tyrosine, histidine, proline, serine, cystine, methionine, or glycine were used to enrich lagoonal water. Several gram negative rod-shaped organisms (both motile and non-motile), cocci, and spirilla were always found. Vibrio, Benecka, Agarbacterium, and Pseudomonas were tentatively identified. Addition of serine, methionine, and proline; cystine, proline, histidine, and glycine; serine, histidine, cystine, glycine, and methionine caused greater growth. Glycine inhibited growth when either or both cystine and tyrosine were present. Addition or either cystine or methionine to any non-inhibiting combination enhanced growth. Yeast extract was an excellent growth enhancing substance. Ammonium ion was inhibitory to these organisms. Addition of water soluble vitamins had no effect. The lipid extract of yeast extract caused only slight enhancement, but the extracted residue yielded excellent growth. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01895

PHYSICAL ASPECTS OF THE LAGOONAL COMPLEX SURROUNDING KSC (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
P. S. Dubbelday.
In: A Study of Lagoonal and Estuarine Processes in the Area of Merritt Island Encompassing the Space Center, Annual Report July 1973-August 1974, p III-1--III-3, (NASA CR-140601). NASA NGR 10-015-008.

Descriptors: *Water circulation, *Estuaries, *Lagoons, Winds, Florida, Currents(Water), Wind velocity.
Identifiers: Kennedy Space Center(Fla), Merritt Island(Fla), Haulover Canal(Fla).

The water movement in this lagoon system is essentially wind driven. Transport through Haulover Canal was measured as a function of water level difference at its ends and correlated with wind patterns. The small difference between surface and average current indicated an almost uniform profile. For current from Indian River to Mosquito Lagoon, optimal wind direction was southwest, and from Mosquito Lagoon to Indian River, due north. There was a close relation between local wind and surface current. When wind blew over the lagoon, a stationary vertical velocity profile was established in about 5 minutes; transport caused water pile-up against the shores; and a 'slope current' was formed by this water level difference. The time constant depended on water surface length in flow direction. For crosswinds, stationarity may be established in one hour; for lengthwise winds, stationarity may not occur in the time a given wind pattern is permanent. Wind set-up influences vertical current profile strength and may produce a direction variation of current with depth. Wind driven currents exist in shallow water. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01896

SEDIMENT ANALYSIS OF THE LAGOONAL COMPLEX SURROUNDING KSC (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
E. H. Kalajian.
In: A Study of Lagoonal and Estuarine Processes in the Area of Merritt Island Encompassing the Space Center, Annual Report July 1973-August 1974, p IV-1-IV5. 4 fig. (NASA CR-140601). NASA NGR 10-015-008.

Descriptors: *Lagoons, *Estuaries, *Bottom sediments, Florida, Sands, Silts, Cores, Carbon..
Identifiers: Kennedy Space Center(Fla), Merritt Island(Fla), Indian River(Fla), Mosquito Lagoon(Fla), Banana Creek(Fla).

Bottom sediments in the Indian River and Mosquito Lagoon areas, Florida, are predominately a fine sand with shell or trace of shell material. Variations with depth and shell layering or bonding occurred frequently in many of the cores. The effect of the burrowing of benthic organisms was often observed. Silt and silty sand occurred at certain locations at deeper water depths. The color of wet sediments ranged from very dark grey to olive. Organic carbon contents of bottom sediments ranged from 0 to 2.4%; the majority of the sediments had values less than 1%. These values compared with sediments of similar texture from other coastal locations. A few chemical stratigraphy studies were made, but no conclusions can be drawn at present. Equipment for testing the filtering aspects of sediments on hypergolic fuels is being set up. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01897

WATER QUALITY PARAMETERS OF THE LAGOONAL COMPLEX SURROUNDING KSC (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
J. A. Lasater.
In: A Study of Lagoonal and Estuarine Processes in the Area of Merritt Island Encompassing the Space Center, Annual Report July 1973-August 1974, p V-1--V-15. 6 fig, 1 tab. (NASA CR-140601). NASA NGR 10-015-008.

Descriptors: *Water quality, *Lagoons, *Estuaries, Florida, Subtropic, Shallow waters, Rainfall, Evaporation, Sampling, Statistical methods, Temperature, Salinity, Hydrogen ion concentration, Dissolved oxygen, Nitrates, Phosphates, Turbidity.
Identifiers: *Kennedy Space Center(Fla), Merritt Island(Fla), Mosquito Lagoon(Fla), Indian River(Fla), Banana River(Fla).

Merritt Island is located on the east central Florida coast, at the apex of Indian River Lagoon (Mosquito Lagoon), the Indian River, and the Banana River, which comprise a classical lagoon complex of an estuarine character. Circulation and mixing processes are mostly winddriven with prevailing winds and those immediately preceding meteorological events contributing to the chemical concentrations of the water. Sanitary and storm effluents, water from land drainage projects, and rainfall are sources of fresh water. Evaporation rates are high. Prevailing winds are seasonally almost bidirectional, so there is net transport of winddriven water along the longitudinal SE to NW axis. For statistical evaluation, a sampling pattern was selected utilizing latitudinal-longitudinal coordinates of the area; sampling stations were established at the intersection of each minute of arc of latitude and longitude. Temperature, salinity, pH, dissolved oxygen, nitrate, phosphate, and turbidity for 1972 and 1973 were compared; while 1973 was more moist, the average values were within standard deviations for 1972. Differences observed for the same calendar periods for different years reflected prevailing meteorological conditions. There was general consistency in the statistical evaluations which should permit selection of a limited number of sampling stations for longterm studies. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01898

COMPARATIVE DISCHARGES OF FRESH AND WASTE WATER ALONG THE CALIFORNIA COAST,
California Univ., Santa Cruz. Earth Sciences Board.
For primary bibliographic entry see Field 5B.
W76-01914

TOTAL MERCURY IN SOME FISH AND SHELLFISH ALONG THE MEXICAN COAST,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5C.
W76-01925

MARINE MEIOFAUNA OF A NEW YORK CITY BEACH WITH PARTICULAR REFERENCE TO TARDIGRADA,
City Coll., New York. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-01930

ABOVE GROUND PRODUCTION AND CHEMICAL ANALYSIS OF PHRAGMITES COMMUNIS IN POLLUTED BRACKISH WATER,
Stockholm Univ. (Sweden). Botany Inst.
For primary bibliographic entry see Field 5C.
W76-01943

ON THE INFLUENCE OF SEWAGE POLLUTION ON INSHORE BENTHIC COMMUNITIES IN THE SOUTH OF KIEL BAY. PART I. QUALITATIVE STUDIES ON INDICATOR SPECIES AND COMMUNITIES,
Kiel Univ., (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 5C.
W76-01944

REMARKS ON INDICATOR ORGANISMS (MEIOFAUNA) IN THE COASTAL WATERS OF THE GDR,
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
For primary bibliographic entry see Field 5B.
W76-01946

EFFECTS OF A SULPHATE PULP MILL ON THE BENTHIC MACROFAUNA IN A FIRTH OF THE BOTHNIAN SEA,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5C.
W76-01947

CHANGES IN PLANKTON RESULTING FROM EUTROPHICATION OF A BALTIC FIRTH,
Gdansk Univ. (Poland). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-01948

THE EFFECTS OF FERRY TRAFFIC ON ROCKY SHORE VEGETATION IN THE SOUTHERN ALAND ARCHIPELAGO,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-01949

THE EFFECTS OF FERRY TRAFFIC ON THE ROCKY SHORE MACROFAUNA IN THE SOUTHERN ALAND ARCHIPELAGO: I. THE CLADOPHORA ZONE,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-01950

ALGAL ZONATION ON ROCKY SHORES OUTSIDE HELSINKI AS A BASIS FOR POLLUTION MONITORING,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
For primary bibliographic entry see Field 5C.
W76-01951

CAN NEW YORK'S WETLANDS BE SAVED. A CONSTITUTIONAL AND COMMON LAW SOLUTION,
For primary bibliographic entry see Field 6E.
W76-01964

INTERNATIONAL STRAITS: THE RIGHT OF ACCESS,
Army Staff Judge Advocate's Office, Berlin (Germany).
For primary bibliographic entry see Field 6E.
W76-01965

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

GENERALIZED CRITERIA FOR VERIFICATION OF WATER DEVELOPED THROUGH WEATHER MODIFICATION,
Bittinger M. W. and Associates, Inc., Fort Collins, Colo.
E. B. Jones, C. F. Leaf, and W. H. Fischer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-124, $6.75 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 154 p, 26 fig, 21 tab, 119 ref, append. OWRT-C-4099(No. 9020) (1).

Descriptors: *Weather modification, *Water rights, Water supply, *Model studies, Water law, Colorado, Montana, New Mexico, Texas, Utah, Wyoming, *Legal aspects.
Identifiers: Developed water, Cold orographic situation, Warm season cumulus.

The filing of a water right based on water developed through weather modification appears to be possible in most of the States operating under the appropriation doctrine. The conditions under which this may be practical are considered. Interviews were conducted with selected water resources officials in the States of Colorado, Montana, New Mexico, Texas, Utah, and Wyoming. Based on their input and the use of existing hydrologic and meteorologic simulation models, general guidelines were prepared. An example for the cold orographic situation is included.
W76-01519

WEATHER MODIFICATION OPERATIONS IN CALIFORNIA, OCTOBER 1, 1972 - SEPTEMBER 30, 1973,
California State Dept. of Water Resources, Sacramento, Div. of Planning.
M. M. Schwartz, and M. W. Peyton.
Report, July 1975. 22 p, 11 fig, 12 tab, 2 plates.

Descriptors: *Weather modification, *Cloud seeding, *California, Permits, Regulation, Governments, Projects, Silver iodide, Artificial precipitation, Precipitation(Atmospheric), Rain, Snow, Meteorology.

Chapter 4 of the California Water Code, which governs the regulation of rain-making and rain-prevention, declares that the state shall encourage scientific efforts to develop, increase, and regulate the precipitation of rain and snow in California. Regulation and control of artificial means of interfering with natural precipitation are, by statute, the responsibility of the Department of Water Resources. Persons undertaking such work must be licensed by the department and, upon completion of their operations, must report the manner and extent of their efforts to the department. The report described weather modification efforts carried out in California from October 1, 1972, through september 30, 1973. Nine licensees engaged in 11 projects. All projects made use of silber iodide in various forms as the active agent to increase precipitation. Three projects used both ground-based and airborne generators, and eight used ground-based generators only. No information was available to enable the department to assess the results of these operations. Excerpts from the California Water Code that pertain to the administration of weather modification projects in the state were included. (Sims-ISWS)
W76-01530

ECONOMICS OF LAND LEVELING FOR DRYLAND GRAIN PRODUCTION,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-01692

CYCLIC STORAGE OF FRESH WATER IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 4B.
W76-01811

DEVELOPMENT OF ASPHALT CUSHIONED PLASTIC REINFORCED ASPHALT MEMBRANES FOR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, and R. A. Jiminez.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 553, $4.00 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 29 p, 16 fig, 2 tab, 8 ref. OWRT A-059-ARIZ(2). 14-31-0001-5003.

Descriptors: *Seepage control, *Water harvesting, *Asphalt, Plastics, Barriers, Testing procedures, Aggregates, Materials testing.
Identifiers: Catchments, Reservoir linings, Seepage barriers.

This project was concerned with laboratory equipment development, laboratory testing, construction equipment development and field investigation of the APAC (Asphalt-Plastic-Chip-Coated) water seepage barrier. The laboratory equipment that was designed and fabricated included hydrostatic testing vessels, slope stability apparatus, and tensile testing grips. Three testing methods were utilized and evaluated. The first test method evaluated the hydrostatic puncture resistance of the asphalt-polyethylene combination. The test confirmed the hypothesis that the asphalt effectively increases the puncture resistance of the APAC membrane over that of the plain polyethylene. The second test investigated the slope stability of a protective APAC chip seal. A typical 3/8 in. (9.5 mm) cover aggregate remained stable on constructed slopes of 3:1 and 4:1 and the 2:1 slope remained stable up to a surface temperature of 1220F (50C). The third test method evaluated adhesive materials and indicated that Press-tite mastic was the best suited adhesive for sealing polythylene overlaps. Subsequent field investigations resulted in equipment development that increased construction efficiency in the installation of the APAC membrane. Actual completed field installations were evaluated and further recommendations are included.
W76-01812

RADAR REFLECTIVITY FACTOR CALCULATIONS IN NUMERICAL CLOUD MODELS USING BULK PARAMETERIZATION OF PRECIPITATION,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 2B.
W76-01860

3C. Use Of Water Of Impaired Quality

EFFLUENT: THE FUTURE WATER SUPPLY,
For primary bibliographic entry see Field 5D.
W76-01644

3D. Conservation In Domestic and Municipal Use

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING BENEFITS OF PROTECTING URBAN FLOOD PLAINS,
Washington Univ., St. Louis, Mo., Inst. for Urban and Regional Studies.

For primary bibliographic entry see Field 6B.
W76-01595

WASHINGTON'S WATERFRONT LESSON,
North Carolina Univ. at Chapel Hill. Dept. of Fine Arts.
For primary bibliographic entry see Field 6B.
W76-01596

FORMULATION OF WATER RATES FOR BALTIMORE COUNTY, MD.,
Baltimore County Dept. of Public Works, Towson, Md.
For primary bibliographic entry see Field 6C.
W76-01608

FORECASTING URBAN WATER USE: COMMERCIAL ESTABLISHMENTS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W76-01609

BENEFITS AND COST OF DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-01798

STOCHASTIC MODELS FOR GROUND WATER LEVELS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W76-01799

ECONOMICS OF WATER SUPPLY PLANNING AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W76-01802

3E. Conservation In Industry

PRODUCTION OF SUPERHEATED STEAM FROM VAPOR-DOMINATED GEOTHERMAL RESERVOIRS,
Geological Survey, Menlo Park, Calif.
A. H. Truesdell, and D. E. White.
Geothermics (Italy), Vol 2, Nos 3 and 4, p 154-173, September-December, 1973. 7 fig, 5 tab, 56 ref.

Descriptors: *Geothermal studies, *Thermal water, *Steam, *Energy transfer, Model studies, Subsurface investigations, Thermodynamic behavior, Energy, Heat flow, Methodology, Evaluation.
Identifiers: *Geothermal systems, *Geothermal reservoirs.

Vapor-dominated geothermal systems such as Larderello, Italy, The Geysers, California, and Matsukawa, Japan, yield dry or superheated steam when exploited. Models for these systems are examined along with production data and the thermodynamic properties of water, steam, and rock. These systems initially consist of a water and steam filled reservoir, a water-saturated cap rock, and a water or brine-saturated deep reservoir below a water table. Most water in all parts of the system is relatively immobilzed in small pores and crevices; steam dominates the large fractures and voids of the reservoir and is the continuous, pressure-controlling phase. With production, the pressure is lowered and the water boils, causing massive transfer of heat from the rock and its eventual drying. Passage of steam through already dried rock produces superheating. After an initial vaporization of water in the reservoir, the decrease in pressure produces increased boiling below the deep water table. With heavy exploitation, boiling extends deeper into hotter rock and the temperature of the steam increases. This model explains most features of the published production behavior of these systems and can be used to guide exploitation policies. (Woodard-USGS)
W76-01587

WATER CONSERVATION--AN ALTERNATIVE TO SOLVENT DYEING,
Sandoz Products Ltd., Leeds (England).
G. H. Lister.
Journal Society of Dyers and Colourists (G. B.), Vol 88, No 1, p 9-14, 1972. 5 tab, 4 ref.

Descriptors: *Water conservation, *Textiles, *Dyes, Industrial water.
Identifiers: Foam dyeing, Textile industry, Process modification.

To reduce the amount of water used and effluent produced during textile dyeing the dyeing process was conducted by foam. By converting small volumes of water into large volumes of microfoam in the subtrate body by adding a foaming agent to the dye liquor, even distribution of liquor was rapidly obtained. Subsequent heating fixed the dye to give level, well-penetrated color. The principle is also applicable to preparatory and finishing processes. Foam-forming properties and air-solution interfacial tensions of various foaming agents were determined. Even dye distribution was due to foam, not surface tension. Distribution time was an inverse function of the liquor: goods ratio and concentration of foaming agent. No exact mathematical relationship between liquor:goods ratio, foaming agent concentration, and mechanical force was established. Recipes for production of dyeings on various materials are given. Foam enabled application of dyes which cannot be applied by conventional means. Fixation problems occur because foam is a good heat insulator. Fluorescent brighteners can also be added with this technique. The process is technically and commercially viable. A system has been devised that uses only 2.5-5% of the water required for conventional dyeing processes. (Buchanan-Davidson--Wisconsin)
W76-01628

TREATING DYE WASTEWATER,
Cone Mills Corp., Greensboro, N.C.
For primary bibliographic entry see Field 5D.
W76-01629

CONSERVING OUR RESOURCES--THE CONTRIBUTION OF CHEMICAL TECHNOLOGY,
J. N. Smith.
Chemistry and Industry (G.B.), p 546-548, June 16, 1973. 1 fig, 2 tab.

Descriptors: *Water reuse, *Recirculated water, *Water conservation, *Sugar beets, Industrial water, Europe, Sludge.
Identifiers: England.

Water reuse techniques adopted by the best sugar industry in Britain reduce effluent from 1200 to 30 tons for every 100 tons of beets processed. Water is removed from beet pulp, then returned to the diffusers. Formaldehyde restricts bacterial activity on organic matter dissolved in circulating water. Transport water passes over screens to remove beet tails; muddy water goes to a thickener where water is decanted for reuse and the precipitated mud is pumped to settling ponds. Because of dissolved organic matter, lime is required to maintain neutrality and avoid corrosion. Water, needed to condense water evaporated during sugar crystallization, can be reused after cooling. Chlorine or hypochlorite is used to prevent growth of slime-forming organisms in recirculated water. Lime sludge is pumped without dilution. Separate water systems are used for turbine oil and alternator air cooling, washwater for beet analysis, and ash conveying. Clarified transport system water is used to wash carbon dioxide from the lime kiln and returned. Cooling of vacuum pumps, air compressors, and fluid couplings is often integrated into the condenser circulation system. Water reuse requires expenditure for the new plant and increased running costs. (Buchanan-Davidson--Wisconsin)
W76-01630

A SURVEY OF WASTEWATER TREATMENT TECHNIQUES FOR STEEL MILL EFFLUENTS,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 5D.
W76-01631

THE TREATMENT OF BLAST FURNACE GAS WASHING EFFLUENT,
British Steel Corp., Wolverhampton (England). Bilston Works.
For primary bibliographic entry see Field 5D.
W76-01633

TERTIARY TREATMENT OF PROCESS WATER,
American Oil Co., Whiting, Ind.
For primary bibliographic entry see Field 5D.
W76-01634

SOME EFFECTS OF METALS DISCHARGED IN EFFLUENTS AND POSSIBILITIES FOR THEIR RECOVERY,
Water Pollution Research Lab. Stevenage (England).
For primary bibliographic entry see Field 5D.
W76-01639

WASTE TREATMENT FOR THE PABST BREWERY AT PERRY, GEORGIA,
Wiedeman and Singleton, Atlanta, Ga.
For primary bibliographic entry see Field 5D.
W76-01640

LIMESTONE TREATMENT OF RINSE WATERS FROM HYDROCHLORIC ACID PICKLING OF STEEL,
Armco Environmental Engineering, Middletown, Ohio.
For primary bibliographic entry see Field 5D.
W76-01641

REMOVAL OF ZINC FROM PLATING RINSE WATER BY SIMPLE NEUTRALIZATION,
Dittmann (Carl) and Co., Karlsruhe (West Germany).
For primary bibliographic entry see Field 5D.
W76-01642

WASTES FROM THE MALTING AND BREWING INDUSTRY,
For primary bibliographic entry see Field 5D.
W76-01646

NEW WASTE WATER PRACTICES IN DAIRY PLANTS,
CREPACO, Inc., Chicago, Ill.
R. A. Elliott.
Journal of Milk and Food Technology, Vol 36, No 9, p 453-455, 1973, 3 fig.

Descriptors: *Water reuse, *Dairy industry, *Waste water treatment, Water conservation, Costs, Byproducts, Sludge disposal.
Identifiers: *Dairy wastes, *Cleaning operations, Process modification.

Recent water pollution legislation is requiring that the dairy industry reevaluate present operations in terms of reducing waste water. About 87% of the plants now dump waste water into municipal sewage systems, but increased treatment charges are demanding reevaluation of this method. The advantages and limitations of the cleaning-in-place and high-temperature-short-time systems are described. By proper system engineering, plant cleaning-in-place systems can be very efficient. Waste water loads, water, steam, and chemical composition can be greatly reduced. Plant recovery programs should be established to dispose of damaged or broken cartons and the product in cartons from filling areas. Conveyor lubricants should be used at low concentrations because they contain 25% hexane solubles. Sludge from separators or clarifiers should be collected and not be allowed to reach plant drains. Positive hose shut-offs should be installed to prevent excess amounts of water from going to the drain. Some plants may have to build their own waste treatment facilities. Traditional means of operating must be reevaluated. (Buchanan-Davidson--Wisconsin)
W76-01647

THE RECOVERY OF METALS FROM RINSE WATERS IN 'CHEMELEC' ELECTROLYTIC CELLS,
Electricity Council Research Centre, Capenhurst (England).
For primary bibliographic entry see Field 5D.
W76-01677

EVALUATION OF GEOTHERMAL ACTIVITY IN THE TRUCKEE MEADOWS, WASHOE COUNTY, NEVADA,
Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-01683

FACTORS AFFECTING SLIME ACCUMULATION IN FIBERBOARD MILL PROCESS WATER,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-01689

POSSIBLE IMPACTS OF OIL SHALE DEVELOPMENT ON LAND RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5C.
W76-01691

CIVIL ENGINEERING FEATURES OF GEOTHERMAL POWER PLANT,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 8C.
W76-01701

SALT RIVER PROJECT ANNUAL REPORT, 1974.
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 6B.
W76-01704

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ., Tucson. Div of Economic and Business Research.
For primary bibliographic entry see Field 6B.
W76-01709

ENERGY DEVELOPMENT IN THE ROCKY MOUNTAIN REGION: GOALS AND CONCERNS.
Federation of Rocky Mountain States, Inc. Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-01710

PURIFICATION OF INDUSTRIAL WASTE WATER,
Regie Nationale des Usines Renault, Paris (France); and Regie Nationale des Usines Peugeot, Paris (France).
For primary bibliographic entry see Field 5D.
W76-01721

REMOVAL OF CHROMIUM FROM PLATING RINSE WATER USING ACTIVATED CARBON,
Battelle, Columbus Lab., Ohio.
For primary bibliographic entry see Field 5D.
W76-01867

3F. Conservation In Agriculture

RELATIONSHIP OF CROP METABOLISM AND WATER STATUS TO IRRIGATION NEED,
Illinois Univ. at Urban-Champaign. Dept. of Botany; and Illinois Univ. at Urban-Champaign. Dept. of Agronomy.
S. Jurgens, R. R. Johnson, and J. S. Boyer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-105, $3.50 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 101, July 1975, 12 p, 2 fig, 1 tab, 6 ref. OWRT A-070-ILL(1). 14-31-0001-5013.

Descriptors: Irrigation, *Photosynthesis, Translocation, *Drought, *Crop production, Water utilization, *Metabolism, Irrigation efficiency, Corn(Field).

Irrigation represents the largest segment of consumptive water use in the U.S. Consequently, improvements in the efficiency of irrigation can have an important effect on the amount of water available for other uses. This research was initiated to determine the physiological limitations to crop yield during drought. The identification of these parameters may provide a way of estimating plant need for irrigation and avoiding unnecessary applications of water. Maize was grown to maturity, and photosynthesis and translocation of photosynthates were studied when drought occurred during grain development. Both carbon-14 labeling of the photosynthetic products and dry weight determinations indicated that net photosynthesis was substantially reduced whereas translocation was relatively rapid during drought. Furthermore, grain production occurred in proportion to the cumulative photosynthesis for the season. It was concluded that photosynthesis was more limiting than translocation to grain fill under dry conditions and that photosynthetic behavior could be used to reflect the need of maise crops for water.
W76-01512

SOYBEAN AND CORN ROOTING IN SOUTHWESTERN MINNESOTA: II. ROOT DISTRIBUTIONS AND RELATED WATER INFLOW,
Agricultural Research Service, Pendleton, Oreg.
For primary bibliographic entry see Field 2D.
W76-01528

THE DEVELOPMENT OF A CENTER PIVOT WASTEWATER IRRIGATION MACHINE,
Metropolitan Sanitary District of Greater Chicago. Ill.
For primary bibliographic entry see Field 5D.
W76-01565

TRICKLE IRRIGATION LATERAL DESIGN,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
T. A. Howell, and E. A. Hiler.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 5, p 902-907, September-October 1974. 5 fig, 2 tab.

Descriptors: *Irrigation design, *Hydraulics design, *Hydraulic properties, *Computer programs, Irrigation systems, Irrigation, Agriculture, Design.
Identifiers: *Trickle irrigation, *Drip irrigation.

A design method for determining the pressure loss and emitter flow ratio for trickle irrigation laterals is presented. The design method is based upon known principles of fluid mechanics. A computer program was written to determine the lateral pressure loss and emitter flow ratio at a given design length as a function of pipe size, tree spacing, number of emitters per tree, emitter spacing, downstream lateral pressure, and lateral slope. For a given set of design inputs, the program can be used to determine if the given pipe size will be adequate to limit the pressure loss and flow variation along the lateral to limits acceptable for the design lateral length. (Skogerboe-Colorado State)
W76-01568

HISTORY OF IRRIGATION AND CHARACTERISTICS OF STREAMFLOW IN NORTHERN NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4A.
W76-01589

SCIENTIFIC SYMPOSIUM ON DAIRY EFFLUENT TREATMENT,
For primary bibliographic entry see Field 5D.
W76-01632

ECONOMICS OF LAND LEVELING FOR DRYLAND GRAIN PRODUCTION,
Southwestern Great Plains Research Center, Bushland, Tex.
O. R. Jones, and J. L. Shipley.
Journal of Soil and Water Conservation, Vol 30, No 4, p 177-181, July-August, 1975. 2 fig, 4 tab, 16 ref.

Descriptors: *Dry farming, *Semiarid climates, *Bench leveling, *Terracing, *Crop production, Agriculture, Farm management, Land forming, Erosion control, Land management, Water conservation, Economics, Costs, Grain sorghum, Wheat.
Identifiers: Bench terraces, Conservation bench terraces, Land leveling systems.

Land leveling can increase the water available for crop production by conserving runoff and thereby increasing dryland crop yields in a semiarid climate. Land leveling systems (bench terraces and conservation bench terraces) were cropped in continuous grain sorghum, and conservation bench terrace watersheds were cropped in a wheat-sorghum-fallow sequence. Conservation bench terrace systems were more profitable than bench terraces because land leveling costs were less. For land-leveling systems to be profitable, crop production must be increased sufficiently to pay an annual return on leveling construction costs. For continuously cropped grain sorghum, the probability of producing high yields (greater than 2,000 pounds per acre) was 1 year in 2 on conservation bench terrace benches, 1 year in 4 on bench terraces, and 1 year in 9 on sloping, unterraced plots. (Robinett-Arizona)
W76-01692

CONSERVATION OF SEDIMENT IN IRRIGATION RUNOFF,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.

For primary bibliographic entry see Field 4D.
W76-01693

GROUNDWATER MANAGEMENT AND SALINITY CONTROL: A CASE STUDY IN NORTHWEST MEXICO,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 4B.
W76-01695

EVAPOTRANSPIRATION OF DRYLAND BARLEY WITH DIFFERENT PLANT SPACING PATTERNS,
California Univ., Riverside.
For primary bibliographic entry see Field 2D.
W76-01697

RATES OF HERBICIDES IN IRRIGATED COTTON,
Agricultural Research Service, Phoenix, Ariz.
H. F. Arle, and K. C. Hamilton.
Weed Science, Vol 23, No 3, p 179-181, May, 1975. 5 tab, 7 ref.

Descriptors: *Herbicides, *Weed control, *Irrigation, *Cotton, Weeds, Plant groupings, Plant growth, Crop production.
Identifiers: Trifluralin, Diuron, Gossypium hirsutum L. Delta-pine 16.

Two levels of trifluralin and diuron were applied in three populations of cotton (Gossypium hirsutum L. Delta-pine 16). Compared to cultivation, all herbicide combinations improved weed control. Applications of 0.28, 0.42, and 0.56 kilograms per hectare of trifluralin combined with 0.56 kilograms per hectare of diuron controlled annual weeds and produced the highest cotton yields. Herbicide applications were more effective for weed control and crop yield improvement than was crop spacing. The 80 to 90 percent weed control achieved with low rates of herbicide allowed some weeds to mature seed and certain weeds could therefore increase if this combination is used for more than 1 year. However, the use of lower rates in herbicide combinations should reduce herbicide residuals in the soil. (Robinett-Arizona)
W76-01698

SOUTH PLATTE RIVER FLOW CORRELATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-01699

DESIGN OF IRRIGATION RUNOFF RECOVERY SYSTEMS,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
G. E. Stringham, and S. N. Hamad.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR 3, p 209-219, September 1975. 2 fig, 5 ref, append.

Descriptors: *Distribution systems, *Surface irrigation, *Irrigation engineering, *Irrigation efficiency, *Agricultural runoff, Furrow irrigation, Irrigation systems, Irrigation design, Irrigation operation and maintenance, Irrigation water, Water distribution(Applied), Runoff, Computer programs.
Identifiers: *Irrigation Runoff Recovery Systems.

The design of an Irrigation Runoff Recovery System is demonstrated; it eliminates the need for a cut-back type of irrigation by using a constant supply stream discharge, a constant discharge from the recirculating pump, a constant furrow discharge, and a constant number of furrows in each set. This is accomplished by irrigating the entire first set from the inflow water and collecting the runoff in a storage reservoir. The remaining sets, except the last one, are irrigated by both the supply stream and the runoff water, recirculated by pump, and the last set is irrigated entirely by pumped runoff water. A technique is provided to determine the number of furrows to be irrigated from the supply and pumped streams, the number of sets and furrows in each set, the volume of storage required in the storage reservoir, and the recirculating pump flow rate. A Fortran IV computer program has been written that gives the system balance for incremented values of supply stream discharge and time of supply stream inflow. A copy of the complete computer program for the design process is available at cost from the writers, upon request. (Robinett-Arizona)
W76-01702

ANCHORING DEVICE FOR A FLEXIBLE SPRINKLER HOSE,
R. H. Kaatz.
U.S. Patent No 3,908,909, 5 p, 7 fig, 15 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2243, September 30, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Irrigation operation and maintenance, Equipment, Anchors.
Identifiers: Sprinkler hose.

This invention relates to improvements in anchoring devices for a flexible sprinkler hose. Such flexible sprinkler hoses are formed of a flexible material such as plastic and have rows of small perforations or holes along one side for emitting water in a multiplicity of fine streams along the length of the sprinkler hose. The sprinkler hose has a fitting at one end for connecting it to a water source and a fitting at the other end for closing the end of the sprinkler hose. This invention provides an anchoring device in which the anchor pin is swingable between an anchoring position extending transverse to the hose and a storage or transport position in which the anchor pin extends lengthwise of the hose. The anchoring device can be economically formed and easily applied to the flexible sprinkler hose. It is comprised of a one-piece body of resilient plastic material having an intermediate body portion adapted to underly the hose, an elongated anchor pin portion integrally connected at one end to the intermediate body portion by a thin flexible connector, and a hose engaging portion adapted to at least partially encircle the sprinkler hose. (Sinha-OEIS)
W76-01724

A FIELD STUDY ON THE RELATIONSHIP OF TEMPERATURE AND ICE TO INFILTRATION AT A SPRAY IRRIGATION FACILITY,
Michigan State Univ., East Lansing. Dept. of Civil and Sanitary Engineering.
For primary bibliographic entry see Field 2G.
W76-01810

IRRIGATION DEVELOPMENT COSTS AT THE FARM LEVEL.
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6B.
W76-01821

DESIGN AND USE OF CLOSED-TOP INFILTROMETERS.
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2G.
W76-01854

WATER USE, SEMINAR DAMASCUS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, 7-13 December 1971, Irrigation and Drainage Paper No 13, FAO, Rome, Italy, 1972. 312 p.

Descriptors: Irrigation practices, Irrigation efficiency, Farm management, Water requirements, Water management(Applied), Agriculture, Drainage, Foreign projects, Foreign countries, Foreign research, Crop production.

tThe main objective of the Water Use Seminar was to bring together senior government officials and experts from the Near East Region, and consultants and FAO officers to discuss and exchange information on their experience in the field of water management and water use in agriculture, specifically those aspects connected with increased effectiveness in water use at the farm level. The seminar was concerned with the determination of water requirements, water application and drainage, water control and management, scheme operation, and farmers' education and comprehension. This report should serve as reference material for those concerned with water use in agriculture in the Region. In view of the importance of experience, the different countries were requested to prepare contributions to each subject of the agenda of the seminar to reflect thei experience. These contributions are included in the technical report under the appropriate chapters. (See W76-01879 thru W76-01891)
W76-01878

THE ROLE OF EFFECTIVE IRRIGATION WATER MANAGEMENT AT THE FARMER'S FIELD,
Food and Agriculture Organization of the United Nations, Rome (Italy).
H. M. Horning.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 10-21, 2 fig, 4 tab.

Descriptors: *Irrigation practices, *Irrigation efficiency, *Farm management, *Water requirements, *Water management(Applied), Irrigation, Irrigation systems, Arable land, Irrigation design, Irrigation programs, Irrigation water, Water resources, Irrigation operation and maintenance, Water sources, Drainage, Irrigation effects, Fertilization, Timing, Water resources development, Planning, Water quality, Water loss, Costs, Agriculture.

In addition to the effective manipulation of soil moisture, proper management of irrigation and drainage also permits the provision of optimum conditions for fertilizer use, the introduction of highly responsive seeds and advanced tillage techniques and practices. The author suggests a new approach towards water development projects: The allocation of scarce water resources and planning of costly water development projects should no longer be based on empirical formulas; instead effective water use in agriculture calls for a new type of complex planning of water resources development in relation to the utilization of other resources, soil fertility, cropping pattern and crop returns. Key factors in water use planning including the amount of water needed, timing of water application, cropping schedules, water quality, and water losses are discussed. The costs of water development for agriculture are basically determined by water needs. The value of irrigation depends basically on the contribution it can make to reach a defined development objective and the effectiveness with which investments can be used. Returns from irrigation investments depend on the effectiveness with which irrigation is used by the

farmers and the know-how and experience of farmers in irrigation practices and modern agriculture. (See also W76-01878) (Robinett-Arizona)
W76-01879

WATER USE IN IRRIGATION PROJECTS IN THE SYRIAN ARAB REPUBLIC,
International Commission on Irrigation and Drainage, New Delhi (India); and Syrian National Committee.
N. Rifai.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No. 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 22-36, 2 fig, 9 tab, 3 ref.

Descriptors: *Irrigation programs, *Water requirements, *Water utilization, *Agriculture, *Water resources, Water sources, Water supply, Irrigation practices, Farm management, Water management(Applied), Irrigation, Irrigation water, Arable land, Drainage, Water quality, Water resources development, Arid lands, Irrigable land, Rainfall.
Identifiers: Syria.

Syria is situated in an arid or semiarid zone with large areas of arable and irrigable lands, with 70% of the population dependent on agriculture and agricultural industries for their living. A brief description is given of soils, precipitation, water resources, the population, irrigation projects, land and water use experimental farms, and water use in Syria. Problems concerning the effective use of water in Syria call for (1) study of the hydrological basins and water yield estimations, (2) a land and soil survey and classification, (3) studies on evaporation suppression, (4) increase in irrigation efficiency, (5) drainage studies, (6) study of various irrigation methods, (7) water quality investigations, (8) an increase in the number of agrometeorological stations, and (9) instruction of farmers on the value of making the best use of water in the field. (See also W76-01878) (Robinett-Arizona)
W76-01880

DETERMINATION OF WATER REQUIREMENTS IN IRRIGATION PROJECTS,
United Nations Development Program. Rome (Italy).
A. Marasovic.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 75-89, 4 fig, 6 tab, 14 ref, 2 append.

Descriptors: *Irrigation efficiency, *Water requirements, *Water supply, *Evapotranspiration, Irrigation practices, Water management(Applied), Irrigation, Irrigation programs, Agriculture, Water loss, Water resources, Water utilization, Crop production.
Identifiers: Water requirement estimation, Blaney-Criddle method.

When determining the necessary level of accuracy for crop water requirements, the various parameters determining the level of accuracy required need to be considered first. These parameters include the magnitude of the project (when the area is very large, accuracy may be low, and vice-versa), and water resources availability. This paper gives an analysis of the elements of the calculations of water requirements, and discusses the verification of the theoretical calculation. The value of experiments in the verification of theoretical calculations is also described. A long-term series method of determining water requirements for an irrigated area using the Blaney-Criddle formula is given. (See also W76-01878) (Robinett-Arizona)
W76-01881

WATER BALANCE STUDIES,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria). Div. of Atomic Energy in Food and Agriculture.
Y. Barrada.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 90-96, 10 ref.

Descriptors: *Water balance, *Evapotranspiration, *Lysimeters, *Soil water, *Hydraulic conductivity, Precipitation(Atmospheric), Runoff, Water conservation, Water loss, Infiltration, Consumptive use, Water requirements, Crop production, Irrigation, Irrigation water, Soil moisture, Drainage, Tensiometers, Nuclear moisture meters.
Identifiers: Thermocouple psychrometers, Soil water potential.

Studies of crop water use often involve the determination of all the components of the water balance equation: precipitation, irrigation, surface runoff, change in soil moisture storage, evapotranspiration, time, and drainage. The inputs precipitation, irrigation and surface runoff tend to be discrete in character and can be separately determined. Determination of evapotranspiration using lysimeters and the subsequent problems involved are discussed. Through drainage can be calculated if the relationship between hydraulic conductivity and water content, including the value at saturation, is known, the gradient in hydraulic potential is directly measured with tensiometers, and the soil moisture content is also known. The determination of hydraulic conductivity using tensiometers is described along with the thermocouple psychrometer method for measuring soil water potential and the use of the neutron moisture meter for measuring change in soil moisture storage. (See also W76-01878) (Robinett-Arizona)
W76-01882

RADIATION EQUIPMENT AND THE PRINCIPLES INVOLVED IN ITS USE,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria), Div. of Atomic Energy in Food and Agriculture.
For primary bibliographic entry see Field 2G.
W76-01883

WATER REQUIREMENTS OF CROPS,
Soil Inst., Tehran (Iran).
H. Siadat.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 123-130, 8 tab.

Descriptors: *Water requirements, *Crop production, *Irrigation efficiency, *Soil moisture, *Meteorological data, *Irrigation practices, Plant growth, Water supply, Water resources, Arid lands, Rainfall, Lysimeters, Evapotranspiration, Water balance, Soil water, Soil moisture, Water conservation, Water loss, Consumptive use, Irrigation.
Identifiers: Penmen's equation, Blaney-Criddle formula, Turc's formula, Iran.

This paper reports water requirements of crops growing in the arid to semiarid country of Iran in which the average annual rainfall is 240 mm. More than 90 percent of the country receives insufficient precipitation. A summary is given of the most economical water treatments for sugar beet, alfalfa, sunflower, and cotton, and yield of rice under different depths of submergence. The author concludes that the most reliable method for determination of crop water requirements is field experimentation, although other methods such as the use of lysimeters and meteorological data are easier and quicker. Each method should be employed for at least 3 to 4 years before the data obtained can be used for practical purposes. The most important aspect in field experiments is accurate and continuous determination of soil moisture content during the growing season of crops. Among the different meteorological formulas, Penman's equation was the most accurate, while the Blaney-Criddle or Turc equations were easier to use. (See also W76-01878) (Robinett-Arizona)
W76-01884

SURFACE IRRIGATION METHODS AND PRACTICES,
Food and Agriculture Organization of the United Nations, Cairo (Egypt). Near East Regional Office.
A. Arar.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972, p 149-169, 6 tab, 11 ref.

Descriptors: *Irrigation practices, *Irrigation efficiency, *Water requirements, *Surface irrigation, *Furrow irrigation. *Flood irrigation, Water management(Applied), Irrigation, Irrigation systems, Irrigation design, Irrigation water, Economics, Water resources, Irrigation operation and maintenance, Drainage, Timing, Planning, Agriculture, Crop production, Irrigation engineering, Drainage systems, Drainage engineering.

Economical irrigation requires uniform application of water at the proper time and proper amount for good crop growth and prevention of soil salt accumulation. Essentials in economizing the use of irrigation water are the correct selection of the water application method in relation to given conditions and proper water management to assure the best possible results from any adopted method. No irrigation scheme should be considered without phased provision of drainage. Irrigation, leaching and drainage should be considered collectively in the overall plan for an area in order to obtain maximum efficiency. The design of the irrigation and drainage networks has to first meet the requirements of agricultural production and efficient water management at the field level. Also, the design should start from the field level and should be based on correctly determined and field tested parameters. A good knowledge of crop water requirements also is essential for efficient water management. (See also W76-01878) (Robinett-Arizona)
W76-01885

TECHNICAL ASPECTS OF WATER CONVEYANCE AND DISTRIBUTION SYSTEMS,
Agricultural Univ., Wageningen, (Netherlands).
I. Nugteren.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and

Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972, p 170-185, 2 fig, 3 tab.

Descriptors: *Irrigation practices, *Irrigation systems, *Water management(Applied), *Distribution systems, *Water requirements, Irrigation efficiency, Farm management, Irrigation, Irrigation design, Irrigation programs, Irrigation water, Groundwater, Water resources, Water sources, Canals, Rainfall, Evapotranspiration, Timing, Water resources development, Planning, Agriculture, Crop production, Irrigation ditches, Water conveyance, Water utilization, Water supply.
Identifiers: *Field application efficiency.

Improvement of the contribution of irrigation to crop production, together with increased economic and technical efficiency of water utilization, can only be achieved by concentrating the design and operation of the system on the primary purpose of supply and distribution: optimum field application. The long-term water requirement, summarized for the various crops and over the entire cultivated area, forms the basis for determining the necessary supply and the adequacy of available resources. In order to evaluate the field application idea, it is necessary to briefly analyze the important factors such as: rainfall, evapotranspiration, and the field application efficiency. For optimum utilization of the water resources it is necessary that complete control exist regarding the time of availability for one of the resources. In this way a combination of surface water and groundwater supply can be used by having the base supply provided by river diversion, and the incidental peak supply by groundwater. (See also W76-01878) (Robinett-Arizona)
W76-01886

RECENT DEVELOPMENTS IN WATER DISTRIBUTION AND APPLICATION WITH SPECIAL REFERENCE TO SPRINKLER IRRIGATION,
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany). Dept. of Plant Production in Tropical and Subtropical Countries.
W. Achtnich.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 186-210, 13 fig, 119 ref.

Descriptors: *Sprinkler irrigation, *Subsurface irrigation, *Hydroponics, *Irrigation efficiency, *Water requirements, *Irrigation systems, Irrigation practices, Irrigation, Irrigation design, Irrigation water, Salts, Water resources, Irrigation operation and maintenance, Drainage, Irrigation effects, Fertilization, Timing, Planning, Water quality, Agriculture, Arid lands, Root zone, Soil moisture, Soil-water-plant relationships, Bibliographies.
Identifiers: *Drip irrigation.

Sprinkler irrigation may be regarded as the most flexible system of irrigation applicable to most soil and topographic conditions and all kinds of crops. The system can be operated manually or automatically and allows the precise application of water according to field capacity and infiltration rate. Advantages ofsprinkler irrigation are: (1) a minimum of land grading and surface preparation; (2) the use of light sandy soils that do not allow land grading and are not suited for surface methods due to texture and depth of root zone; (3) economy in water application; (4) multipurpose use of the installation for water application, fertilizer and pesticide distribution, control of microclimate and frost protection; (5) little technical knowledge is necessary. Disadvantages include high cost of initial investment and maintenance, although there are less labor costs, and restricted use caused by strong erratic wind and poor quality water. Drip irrigation has many advantages, especially in arid agricultural regions with a limited quantity of irrigation water, and high rates of consumptive use. The ability to regulate the water supply to meet the requirements of the plant and to reduce air and surface evaporation results in reported savings in water up to 50 percent. The use of subirrigation systems and hydroponics is also discussed. (See also W76-01878) (Robinett-Arizona)
W76-01887

INVESTIGATIONS ON SURFACE IRRIGATION METHODS IN THE EUPHRATES BASIN,
United Nations Development Program, Rome (Italy).
I. Petrasovits.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 211-227, 7 fig, 6 tab, 10 ref.

Descriptors: *Irrigation systems, *Surface irrigation, *Furrow irrigation, *Border irrigation, *Irrigation design, *Furrow systems, Water management(Applied), Irrigation, Irrigation practices, Irrigation efficiency, Water requirements, Irrigation water, Timing, Planning, Agriculture, Crop production, Cotton, Soil moisture, Irrigation engineering, Consumptive use.
Identifiers: *Euphrates Basin, Billaneh experimental station.

An experiment was carried out in the summer of 1971 at the experimental station of Billaneh (Euphrates Basin) to collect data for the calculation of furrow irrigation parameters. The average daily water consumption of cotton, with 15% losses, was 8-10 mm in the period of peak water requirements. For an irrigation of 60 mm, the best results were obtained using a furrow length of 50 m with a 1.0-1.2 liter/second water flow; and for an irrigation of 80 mm, best results were obtained using a length of 100 m or more and a water flow greater than 1.2 liter/second. A practical method is given for the choice of parameters for furrow irrigation using tables which correlate these parameters with agronomic and hydraulic requirements for irrigation. Experiments carried out for border strip irrigation showed that the method requires a slope of 0.5-1 percent and good microlevelling. The choice of parameters for border strip irrigation also depends on permeability of the soil, the vegetal cover, and the direction of the sowing lines. (See also W76-01878) (Robinett-Arizona)
W76-01888

IRRIGATION ORGANIZATIONS,
Food and Agriculture Organization of the United Nations, Rome (Italy).
J. A. Sagardoy.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 254-266, 13 ref.

Descriptors: *Water management(Applied), *Irrigation programs, *Farm management, *Administrative agencies, *Irrigation water, Irrigation practices, Water allocation(Policy), Legal aspects, Planning, Water control, Water requirements, Water utilization, Irrigation, Agriculture, Governments, Water resources development, Water rights, Economics.

Water development projects for agriculture should be planned in such a way as to ensure the most effective use of water at the farmer's field. The organization and management of the schemes must be able to enforce effective water use throughout the scheme and include the technical, socio-economic, administrative and educational requirements of water management at the scheme and farm levels. This paper discusses the different ways in which the operation and management of irrigation schemes can be organized and the tasks which irrigation should fulfill: national laws should clearly define water and land rights, farmers' rights to the resources, farmers' participation and government's obligations; one single body should be responsible for the management of the system and properly coordinated with the regional, basin-wide and national organizations in charge of water administration in the country; irrigation schemes must by dynamic and change with time; and the government's control and supervision of water use should be established on a legal basis. (See also W76-01878) (Robinett-Arizona)
W76-01889

TRAINING AND EXTENSION FOR EFFECTIVE USE OF IRRIGATION WATER,
Food and Agriculture Organization of the United Nations, Rome (Italy).
W. D. Maalouf.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 267-276.

Descriptors: *Farm management, *Water management(Applied), *Irrigation programs, *Training, *Irrigation efficiency, Administrative agencies, Irrigation practices, Planning, Water control, Water utilization, Irrigation, Agriculture, Governments, Water resources, Economics, Irrigation water, Irrigation efficiency, Water sources, Crop production.

Modern irrigation requires a farmer who is equipped with needed technical skills who can provide and adequately use farm inputs and apply suitable methods of farm management. This paper deals with the need of farmers' training to insure an effective use of irrigation water which is considered the main element in any effort to improve agricultural production. Training of this nature requires, in each country, a well organized advisory system equipped with competent technical and educational staff. This system should provide for close collaboration between technical, educational, and service agencies (such as Agricultural Extension, Research, Education, Cooperatives, and Credits) who assist farmers with technical information and provide them with needed production inputs and marketing facilities. (See also W76-01878) (Robinett-Arizona)
W76-01890

NEAR EAST APPLIED RESEARCH PROGRAMME FOR LAND AND WATER DEVELOPMENT,
Food and Agriculture Organization of the United Nations, Cairo (Egypt). Near East Regional Office.
L. T. Kadry.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 277-284.

Descriptors: *Water management(Applied), *Irrigation programs, *Arid lands, *Water resources development, *Research and development, Water requirements, Water supply, Arable land, Irrigation water, Water resources, Water sources, Agriculture, Planning, Farm management, Training, Administrative agencies, Water utilization, Irrigation, Governments, Foreign research, Land development, Saline soils.
Identifiers: *Near East countries.

Research is necessary for the inventory of water supply and distribution with particular reference to identifying its source, quality, rate and site of the flow, in addition to relating the water characteristics and parameters with those of the soil and in assessing the outcome of their interaction and their interrelation with the other sectors of the agriculture environment. In the semi-arid and arid areas which occur in almost all the Near Eastern countries, the provision of irrigation water and its economic use are two of the most important factors for increasing agricultural production. The majority of countries in the region need experienced manpower in all phases of the reclamation, improvement and management of salt affected and waterlogged soils, water management and control, and land preparation and related mechanized practices. A regional applied research program for land and water development is discussed considering the major benefits which could accrue to all governments from the proposed solutions and recommendations by the program. The program is designed to activate the existing institutional and manpower resources available for research in the countries concerned and seeks to guide and link their efforts, to help overcome organizational and other constraints and to promote training and extension services. (See also W76-01878) (Robinett-Arizona)
W76-01891

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

HIERACHICAL MANAGEMENT OF GROUND AND SURFACE WATER SYSTEM VIA MULTICELL APPROACH,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
Y. Y. Haimes.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-100, $8.00 in paper copy and $2.25 in microfiche. Ohio Water Reserve Center, Columbus, Interim Report, July 1975, 228 p, 25 fig, 40 tab, 44 ref. OWRT B-062-OHIO(1).

Descriptors: *Groundwater, Management, *Aquifer, Surface water, *Mathematical models, System analysis, Water supply, Water table, *Simulation analysis, *Model studies, *Ohio.
Identifiers: *Multicell system, Surrogate Worth Trade-Off Method, Sensitivity analysis, Parameter identification, Great Miami River Valley, Miami Conservancy District(Ohio), Fairfield-New Baltimore Area(Ohio), Hierarchical management.

A multicell groundwater simulation model was constructed to use the decomposition techniques for better data utilization, and then modified for the large scale, complex groundwater system. The model was applied to the case study, at Fairfield-New Baltimore area, Dayton, Ohio, and the sensitivity analysis of the model for evaluating the various approaches to the parameter identification problems was discussed. The problem of conjunctive use of ground, surface and other water resources systems was addressed. The complexity of the model was dealt with by using hierarchies of functions to relate various system responses to imposed input. Numerically the model could be solved provided those functions were made available by using a hierarchy of aquifer simulation models, resulting in a quadratic program and coordination scheme as a solution procedure. Next the model was applied to the case study, again the Fairfield-New Baltimore area. The scope of model testing was limited by the actual status of the area under study, but even so the potential applications of the developed model were well illustrated. An example problem was formulated and successfully solved where the conjunctive use of groundwater, streams and a surface reservoir was considered. The study was completed by introducing a multiobjective analysis to that same area. At least three noncommensurable objectives could be identified for water use: (1) minimize cost of water supply, (2) minimize environmental damage caused by lowering stream water level, (3) minimize future energy dependence of water supply. (Chao-Ohio State)
W76-01501

RELATIONSHIPS OF LOW, AVERAGE AND FLOOD FLOWS FOR STREAMS IN THE PACIFIC NORTHWEST,
Washington State Univ., Dept. of Civil and Environmental Engineering. Pullman.
For primary bibliographic entry see Field 2E.
W76-01507

A SIMULATION APPROACH TO THE ANALYSIS OF UNCERTAINTY IN PUBLIC WATER RESOURCES PROJECTS,
Georgia Univ., Athens, Inst. of Natural Resources.
For primary bibliographic entry see Field 6B.
W76-01510

PLANNING FOR COASTAL RECREATION OPPORTUNITIES NEAR LARGE URBAN AREAS: A STUDY RELATING TRANSPORTATION AND RECREATION,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W76-01516

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SIXTH VOLUME.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 6A.
W76-01517

AMES RESERVOIR ENVIRONMENTAL STUDY, SUMMARY REPORT.
Iowa State Water Resources Research Inst., Ames.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 144, $12.50 in paper copy, $2.25 in microfiche. ISWRRI Completion Report No 60-SR, (University of Iowa Final Report Series No 9-SR), 1973, 433 p. OWRT A-999-IA(8).

Descriptors: *Iowa, Reservoirs, Environment, *Environmental effects, *Pre-impoundment, *Reservoir sites, *Baseline studies, *Evaluation, Social aspects, Economic impact, Recreation, Water pollution control, Urbanization, Agriculture, Flood control, *Alternative planning, Discount rates, Decision making.
Identifiers: *Ames Reservoir(Iowa), Sensitivity analysis.

This is an environmental resources review study of the proposed Ames Reservoir, Skunk River, Iowa - including the valley's natural resources, agricultural and urban growth, people and their attitudes, recreation needs, water use and pollution control, flood problems, economic values, and impact of alternative development patterns. Identification of the resource uniqueness of the reservoir site and an evaluation of the environmental responses anticipated under alternative development patterns were major objectives of the study. Five major categories were used in conducting the study: (1) Natural and archaeological resources of the valley, reservoir site, and stream system; (2) social and economic impact; (3) outdoor recreation and open-space uses; (4) agricultural influences and effects; and (5) urban influences and effects. The detailed project evaluation was conducted using a sensitivity analysis and new water resources criteria adopted nationally in 1972 and early 1973, or proposed for adoption. Discount rates for economic analysis of 3-1/4, 5-1/2, and 7% were used, and variations in flood frequency methods, population growth rates, and variable needs for recreation, water supply, and water pollution control were introduced to provide an array of results. The environmental impact of all alternatives is presented in the summary report in an expanded array presentation. The results of the environmental review study will serve as a basis for future decision-making. (See also W74-11579, W74-11586, W74-11605, W74-11614 and W74-11623.)
W76-01522

ESTIMATION OF URBAN STORMWATER QUALITY IN KALIHI STREAM DRAINAGE BASIN, OAHU, HAWAII,
Hawaii Univ., Honolulu, Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W76-01525

HIGH-PRESSURE WATER JET CLEANING OF SUBSURFACE DRAINS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 8C.
W76-01564

USE OF DRAINAGE WELLS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-01566

LOW PRESSURE JET CLEANING OF PLASTIC DRAINS IN SANDY SOIL,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 8B.
W76-01569

HYDROLOGIC UNIT MAP--1974, STATE OF WISCONSIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01571

HYDROLOGIC UNIT MAP--1974, STATE OF HAWAII.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01572

HYDROLOGIC UNIT MAP--1974, STATE OF GEORGIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01573

HYDROLOGIC UNIT MAP--1974, STATE OF ILLINOIS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01574

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-01577

SATELLITE RELAY AND PROCESSING OF HYDROLOGIC DATA IN SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7B.
W76-01578

LAKES OF OREGON: VOLUME 3. HOOD RIVER, MULTNOMAH, WASHINGTON, AND YAMHILL COUNTIES,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2H.
W76-01579

MAP SHOWING FLOOD OF APRIL 1975 AT MERIDIAN TOWNSHIP, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-01584

HISTORY OF IRRIGATION AND CHARACTERISTICS OF STREAMFLOW IN NORTHERN NEBRASKA,
Geological Survey, Lincoln, Nebr.
F. B. Shaffer.
Open-file report 7501, September 1975. 15 fig.

Descriptors: *Water resources, *Surface waters, *Streamflow, *Hydrologic data, *Nebraska, Tributaries, Missouri River, River basins, Gaging stations, Flow characteristics, Water utilization, Irrigation programs, Irrigation wells, Statistical methods, Flow rates, Probability.
Identifiers: *White River, *Ponca River, *Niobrara River, *Bazile Creek.

Five streams drain the northern part of Nebraska and are tributaries to the Missouri River above Yankton, S. Dak. Statistical data are presented for 29 gaging sites on White River, Ponca Creek, Niobrara River, and Bazile Creek. The fifth stream, Hat Creek, drains a small area in the extreme northwest corner of the State. Only the description of that basin is included. Streamflow records have been computed from data that represent 1974 conditions of development and water use. Two major irrigation projects have been constructed in the Niobrara River basin since gaging of streamflow began; therefore the complete record of water discharge at some gaging stations includes periods before and after streamflow was affected by diversions to upstream projects. The Whitney Irrigation Project was in operation on the White River before streamflow records were obtained. (Woodard-USGS)
W76-01589

OPERATIONAL SYSTEMS FOR SNOW REMOVAL AND ICE CONTROL: A BACKGROUND/RESOURCE PAPER FOR THE UPPER GREAT LAKES UNIVERSITY CONSORTIUM FOR TRANSPORTATION RESEARCH,
Michigan Technological Univ., Houghton, Mich.
E. Y. Huang.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 935, $4.00 in paper copy, $2.25 in microfiche. Final report, August 31, 1973. 6 p, 4 fig, 3 tab, 172 ref. DOT-OS-30096.

Descriptors: *Operation and maintenance, *Snow, *Snow removal, *Ice, *Deicers, *Transportation, Highways, Airports, Equipment, Ice-brine systems, *Highway icing, Great Lakes, Snowpacks, Michigan, Wisconsin, Minnesota.
Identifiers: Snow vehicles, Snow removal systems, Upper Great Lakes Region, Drift control, Chloride salts.

There is a pacuity of research to date on operational systems for snow removal and ice control in the transportation systems in the United States and elsewhere. Though the primary interest of the author is the Upper Great Lakes Region including Minnesota, northern Wisconsin, and Michigan, he indicates that some of the proposed research could apply in other areas. Total expenditures in 1964 were around $200 million on snow and ice control. Research could result in substantial savings as well as increased safety and efficiency of roads. Intermediate objectives are listed: (1) Properties of snow and ice pertinent to removal and control operations must be determined. The major properties are understood and in Japan a classification system dividing snow and ice into 7 groups is used, but this system is not used now as a criterion for snow and ice removal; (2) Performance and efficiency criteria for various types of commonly used equipment need to be established; (3) Effectiveness of chloride salts as well as their social and environmental impacts must be re-evaluated. At present many aspects remain unknown. There are indications that some use of salts can cause rather than correct some dangerous road conditions; (4) The snowdrifting process should be understood under different geomorphological and climatic conditions. Field experiments are necessary under operational conditions; and (5) Models and techniques for the analysis of operational systems for maximum effectiveness of snow removal and ice control must be developed. Organization and training factors have been studied as has the location of maintenance stations, but much more needs to be done in these and related areas. (Smith-North Carolina)
W76-01591

THE RIVER'S REACH: AN ASSESSMENT OF EXISTING FLOOD PROTECTION IN UPSTREAM WATERSHEDS OF THE CONNECTICUT RIVER BASIN.
Soil Conservation Service, Durham, N.H.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 499, $5.00 in paper copy, $2.25 in microfiche. Prepared for New England River Basins Commission. Supplemental study, March, 1974. 68 p, 13 fig, 6 plates, 26 tab, append. CRSS-SCS 1.1D, 1.3D, 1.3E, 1.4D.

Descriptors: Floods, Flooding, Flood flow, *Flood forecasting, *Flood damage, *Watersheds(Basins), *Flood plains, *Connecticut River, *Flood protection, *Vermont, Streamflow forecasting, Flood data, Flood frequency, Peak discharge, Stage-discharge relations, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Land use, Dikes, Dams, Channel improvement.
Identifiers: Connecticut River Basin(Vt), Passumpsic River(Vt), Whetstone Brook Watershed(Vt), Mill River(Vt), Moose River(Vt), Lyndon(Vt), St Johnsbury(Vt), Battleboro(Vt), Marlboro(Vt), Northampton(Vt), Williamsburg(Vt).

Three watersheds in the Connecticut River Basin were studied to assess existing flood protection and to estimate damages for floods of varying magnitudes. The Passumpsic River Watershed (Vt.) drains 374 square miles and includes the Moose River. Flood damage has occurred 17 times in 150 years, the greatest flood, in 1927, causing $8,927,000 in damages. Development in the flood plain is 32% agriculture, 52% woodland and wetland, 4% urban and 12% miscellaneous. Future flood estimates range from $474,000 in a 10-year flood to $7,510,000 in a 100-year flood. Average annual damage is predicted at $539,200. Lyndon (Vt.) and St. Johnsbury (Vt.) in this watershed both have flood plain zoning ordinances, but existing flood plain development is unprotected. Land use in the Whetstone Brook Watershed (Vt.) is 62% urban, 19% agriculture and 19% miscellaneous. The 1938 flood damages were estimated at $2,887,000. Future flood damage estimates range from $155,000 in a 10-year flood to $3,237,000 in a 100-year flood. Predicted annual damage is $226,800. The town of Battleboro (Vt.) uses state and local regulations to control flood plain development. Marlboro (Vt.) has a flood plain zoning ordinance. The Mill River Watershed drains 59 square miles and land use is 24% agriculture, 20% urban, 44% wetland and woodland, and 12% recreation. The 1938 flood damages were about $860,000 and future damages range from zero in the 10-year flood to $1,135,000 in a 100-year flood. Northampton (Vt.) has a flood management plan, proposed zoning, and a dike and diversion system. Williamsburg (Vt.) is planning control of flood plain use. This report analyses the watersheds in detail and gives many kinds of flood plain protection alternatives. (Smith-North Carolina)
W76-01592

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING BENEFITS OF PROTECTING URBAN FLOOD PLAINS,
Washington Univ., St. Louis, Mo., Inst. for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W76-01595

CONVENTIONAL WISDOM PLUS A NEW PHILOSOPHY--CORPS OF ENGINEERS WATER RESOURCE PLANNING,
For primary bibliographic entry see Field 6E.
W76-01598

FLOOD MANAGEMENT DECISIONMAKING IN THE CONNECTICUT RIVER BASIN: ANALYSIS OF THE EXISTING LEGAL, FINANCIAL AND INSTITUTIONAL FRAMEWORK FOR FLOOD PLAIN MANAGEMENT,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6F.
W76-01599

OPTIMAL PRICING AND INVESTMENT IN COMMUNITY WATER SUPPLY,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 6C.
W76-01600

THE CONCEPT OF WATER RESOURCES DEVELOPMENT,
Central Water and Power Commission, New Delhi (India).
For primary bibliographic entry see Field 6B.
W76-01618

INSTITUTIONAL BEHAVIOR CONCERNING RIVER BASIN MANAGEMENT LEGISLATION,
Doane Coll. Crete, Nebr.
For primary bibliographic entry see Field 6E.
W76-01682

A SCHEME FOR STOCHASTIC STATE VARIABLE WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-01685

SOUTH PLATTE RIVER FLOW CORRELATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. E. Glover.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR 3, p 175-186, September, 1975. 3 fig, 3 tab, 15 ref, 1 append.

Descriptors: *Planning, *Water management(Applied), *Surface-groundwater relationships, *Watersheds(Basins), *Diversion, *Water balance, Streamflow, River flow, Safe yield, *Colorado, Irrigation, Groundwater basins, Hydrogeology, Water table, Water sources, Groundwater, Pumping, Water utilization, Withdrawal, Water resources.
Identifiers: *South Platte River(Colo).

A study was done on the South Platte River in Colorado in order to determine necessary management of the water resources of the valley with respect to water diversions for irrigation and pumping from the valley. A technically sound computation procedure has been developed in order to determine advance quantitative knowledge of what the effect of water resource decisions will be. The equations have been reduced to tabular form and the validity of the computation has been confirmed by testing it against the historic performance of the river. Depletion of the river due to pumping was found to approximate one-fifth of the watershed yield. Computations indicate that the response of river flow to shutting down of wells will be so sluggish that attempts to put wells directly into the priority system will be both ineffective and dangerous. It is concluded that the surface waters and groundwaters of the valley are one water supply since no acceptable flow correlations can be obtained until the return flows to the river from groundwater are accounted for. (Robinett-Arizona)
W76-01699

SUMMARY OF 1975 ROCKY MOUNTAIN LAND USE AND NATURAL RESOURCE BILLS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
For primary bibliographic entry see Field 6E.
W76-01711

THE ROCKY MOUNTAIN REGION: A UNITY OF INTERESTS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-01712

BAYESIAN INFERENCE AND DECISION MAKING FOR EXTREME HYDROLOGIC EVENTS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
E. F. Wood, and I. Rodriguez-Iturbe.
Water Resources Research, Vol 11, No 4, p 533-542, August, 1975. 11 fig, 3 tab, 15 ref.

Descriptors: *Hydrologic aspects, *Mathematical models, *Flood forecasting, Statistical models, Cost analysis, *Decision making, Engineering.
Identifiers: *Bayesian inference, Cost-benefit analysis.

An analysis of parameter uncentainty and the effects of model uncertainty upon decision making, as applied to flood prediction, is discussed. It is argued that the decision theory approach to making decisions is a more rational approach than other procedures which separate inferences, decisions, and preferences. A case study was presented for the determination of the best level of flood protection for Woonsocket, Rhode Island. Each of three probability models was compared, and the Bayesian procedure was employed. Prior data from a regional regression model, historical data, and realistic flood cost and damage functions were used. A calculation was made of the composite Bayesian distribution of flood discharges, which was then used in conjunction with an appropriate utility function to maximize expected utility and net benefits. The results of the Rhode Island study confirmed the expectation that Bayesian statistical procedures could be used to make engineering decisions. (Kramer-FIRL)
W76-01761

MATHEMATICAL MODEL FOR ESTABLISHING THE OVERFLOW SPILLWAY DISCHARGES IN THE FLOOD STORAGE PONDS,
Academia de Studii Economics, Bucharest (Rumania). Dept. of Economic Cybernetics.
V. Ionescu, D. Chebeleu, and U. Berar.
Economic Computation and Economic Cybernetics Studies and Research, No 2, p 71-79, 1975. 3 fig, 2 tab.

Descriptors: *Overflow, *Storm runoff, *Floods, *Mathematical models, Computers, Economics, Storage.
Identifiers: Transylvania.

Equations are presented for the establishment of overflow spillway discharges in storm water retention basins. Overflow spillway discharge is dependent upon the two variables base and height of the spillway wave, which can be modified so that they correspond to an economic minimum. A network of water storage basins is being designed for the most economical system of flood attenuation for the area of the Transylvanian high plains. The amount of overflow spillway discharge was determined by a mathematical model using a calculus program to optimize the economic solution. The scheme has been integrated into a computer program and its details are graphically illustrated. (Kramer-FIRL)
W76-01762

EFFECT OF VALLEY SHAPE ON RETENTION BASIN PERFORMANCE,
A. R. Pagan.
Public Works, Vol 106, No 8, p 84-85, August, 1975. 4 fig, 1 tab.

Descriptors: *Flood control, *Retention, Outflow, Mathematical models, *Reservoirs, *Storage capacity, Hydrographs, Engineering.

A mathematical model was designed to emphasize the importance of the cross-section profile of the valley behind a flood control structure for engineers responsible for selecting storage reservoir sites. Because the amount of storage available should increase as rapidly as possible with increasing depth in order to get the greatest amount of outflow reduction, a U-shaped valley was suggested to be much more effective in suppressing flood peaks than a V-shaped valley. In order to quantify this, an imaginary stream was assumed as well as an outflow versus depth hydrograph. The following curves were used: inflow hydrograph (same for both V-shaped and U-shaped valleys); storage versus depth curve for V-shaped valley; storage versus depth curve for U-shaped valley; and outflow versus depth curve. From these were constructed storage versus outflow curves for V-shaped and U-shaped valleys and $2S/t + 0$ versus outflow curves for V-shaped and U-shaped valleys. When all these curves were plotted, the standard routing procedure was followed and the resulting outflow hydrographs for each valley shapes were compared. It was determined that the peak outflow for the V-shaped valley was 330 cfs and for the U-shaped valley 245 cfs. The percentage of peak inflow was 36.7 for the V-shaped valley and 27.2 for the U-shaped one. Peak storage capacities were 2.25 million cu ft and 2.95 million cu ft, respectively. A greater amount of land might be needed with less advantage for the less efficient V-shaped storage reservoir. Additionally, the routed peak outflow of the U-shaped valley was 74 percent of that of the V-shaped valley. (Kramer-FIRL)
W76-01773

LONG-TERM FLOOD PREDICTION FROM SHORT-TERM RIVER DATA.
Search, Vol 6, No 7, p 250-251, July, 1975.

Descriptors: *Flood forecasting, *Rainfall-runoff relationships, *Australia, Rainfall, Mathematical models, Statistical models, Streamflow.

The problem of flood forecasting in Australia were discussed at the Institute of Engineers' Hydrology Symposium at Armidale. In the Queensland area, streamflow records have only been kept for the past ten years. Because of this, accurate prediction of larger, less frequent floods are not feasible by direct methods. However, the Queensland Irrigation and Water Supply Commission has developed an indirect method to give useful long-term flood forecasts. It was found that annual flood maxima in a catchment have a very close statistical relationship with daily runoff volume in the same catchment. Rainfall records have been kept for a much longer time than streamflow records. Daily runoff volume correlates with rainfall. The rainfall/runoff relationship belongs to a common family of curves, which can be considered in terms of the parameter K2. The K2 value was demonstrated to be useful in obtaining long-term flood predictions from long-term rainfall records. The method was checked for eight catchments for which about of 30 years of complete records were available. The maximum one-in-fifty years and one-in-one hundred years floods were predicted, and the predictions were compared with those made conventionally from the full flood record. The differences between the two predictions (on the average) was less than eight percent. Thus, it may be possible to make reasonably accurate predictions for other catchments with only rainfall data. (Kramer-FIRL)
W76-01776

DENVER SEEKS TOMORROW'S WATER TODAY,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
H. Michel, and G. Oliger.
Water and Wastes Engineering, Vol 12, No 8, p 31-35, August, 1975. 2 fig.

Descriptors: *Computer models, *Water rights, *Water resources, Geological surveys, Environmental effects, Streamflow, Cost analysis, Colorado River, Colorado.
Identifiers: *Denver(Colo), Eagle River, Piney River, Hydrologic study, Operational study.

The Denver Board of Water Commissioners' plant to develop economically and evironmentally sound water sources for the future, using the Eagle, Piney, and Colorado Rivers, are discussed. Four major tasks were required: a hydrologic study; a geological survey; an environmental evaluation; and an operational study. The limits of taking water out of a river forced three considerations: existing water rights; streamflow characteristics; and how the water rights effect the flow at selected points on the stream. Analyzing the exercising of a combination of the existing water rights was a complex task, and, hence, required a computer simulation model. The model selected has been used successfully on other Colorado river projects. The configurations obtained from this method were checked against a geological survey and their environmental impact was considered. The geological survey eliminated some of the configuration choices. After this analysis, four configurations were selected for more detailed analyses. An operational study was then undertaken, along with a cost analysis to choose the best configuration from these four. Another computer simulation model was used for these studies. It was found that the Eagle-Piney/Eagle-Colorado configuration had the greatest firm annual delivery and the lowest unit cost. (Pinto-FIRL)
W76-01779

LOCAL LAND USE CONTROL OVER CRITICAL AREAS,
American Society of Planning Officials, Chicago, Ill.
For primary bibliographic entry see Field 6E.
W76-01790

REGIONAL INSTREAM FLOW NEEDS IN THE PACIFIC NORTHWEST: AN ANALYSIS OF INSTITUTIONAL, LEGAL, AND TECHNOLOGICAL ASPECTS OF ALLOCATION PROCESSES FOR LIMITED STREAMFLOW,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 6B.
W76-01797

BENEFITS AND COST OF DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-01798

CAPACITY OF WATER-BASED RECREATION SYSTEMS, PART III: METHODOLOGY AND FINDINGS,
North Carolina State Univ., Raleigh. Dept. of Recreation Resources Administration.
For primary bibliographic entry see Field 6B.
W76-01804

THE WILLAMETTE RIVER GREENWAY: CULTURAL AND ENVIRONMENTAL INTERPLAY,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 6G.
W76-01805

EVALUATING THE IMPACT OF STRUCTURALLY INTERRUPTED FLOOD PLAIN FLOWS,
Cornell Univ., Ithaca, N.Y. Dept. of Structural Engineering.
D. A. Sangrey, P. J. Murphy, and J. L. Nieber.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 552, $4.00 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Sciences Center, Ithaca, Technical Report 98, October 1975. 25 p, 5 fig, 1 tab, 8 ref, 2 append. OWRT A-059-NY(1). 14-31-0001-5032.

Descriptors: *Flood plains, *Flood plain zoning, *Flood damage, Flood proofing, Erosion, Buildings, Levees, *Flow around objects, Evaluation, *Structural models, *Model studies, *Forecasting.

A procedure has been developed for predicting the interaction of flood waters and structures on the flood plain. The hydrodynamic predictor is a modified form of the U.S. Army Corps of Engineers Program HEC-2. Methods for modifying the input for HEC-2 to account for structures on the flood plain are described. These modifications are principally concerned with roughness and cross-sectional area. Using the results of the hydrodynamic model a procedure is described for estimating the loads on flood plain structures. A nondimensionalized form of the loading has been useful in predicting structural damage. A case study involving modeling of a flood plain for comparison with damage resulting from Tropical Storm Agnes is reported. The damage survey of a region sample of 155 flood plain structures is particularly useful for evaluation of flood damage criteria. A damage criterion has been proposed based on these data.
W76-01808

RELATIONSHIP OF DISCHARGE REDUCTIONS TO AVAILABLE TROUT HABITAT FOR RECOMMENDING SUITABLE STREAMFLOWS,
Wyoming Univ., Laramie. Water Resources Research Inst.
T. A. Wesche.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 514, $5.00 in paper copy, $2.25 in microfiche. Water Resources Series No 53, December 1974. 71 p, 22 fig, 6 tab, 30 ref, append.

Descriptors: *Streamflow, *Aquatic habitats, *Trout, *Average flow, *Flow rates, Discharge(Water).
Identifiers: Trout habitat, *Trout cover, Average daily flow, Minimum flow.

This study to determine suitable streamflows to maintain trout habitat focused on defining changes observed for physical stream characteristics as streamflow was reduced. To relate these changes to reductions in available habitat, criteria were developed defining the cover preferences of trout; criteria from the literature were applied for food production and spawning areas. Trout cover has been defined as instream rubble-boulder areas and overhanging bank cover in association with a water depth of at least 0.50 ft (0.15 m). Using these preferences, a rating system was developed allowing comparisons of available trout cover to be made for one stream section at various discharge levels and for different stream reaches at approximately the same level of flow, based upon the average daily flows (ADF) for the sections. Verification of the rating system as an indicator of the standing crop of trout present was initiated in an attempt to quantify the biological significance of instream dewatering in regard to trout populations. The primary study area had an ADF of 78.7 cfs (2.23 cu m/sec) and was intensively investigated at 100%, 71%, 51%, 38%, 27%, and 11% ADF. Available habitat was found to decrease at the greatest rate for the discharge reduction interval from 27% to 11% ADF. These findings verify earlier results on 2 stream sections having smaller ADFs. As a minimum flow to maintain habitat, a discharge in the 25% ADF range will avoid the flow range for which the rate of habitat decrease is greatest.
W76-01809

DEVELOPMENT OF ASPHALT CUSHIONED PLASTIC REINFORCED ASPHALT MEMBRANES FOR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W76-01812

AN INNOVATIVE ORGANIZATIONAL ARRANGEMENT FOR COMPREHENSIVE WATER SERVICES: THE THAMES WATER AUTHORITY AS A MODEL FOR COMPLEX AREAS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W76-01815

PLANNING WATER RESSOURCES DEVELOPMENT.
Economic Commission for Asia and the Far East (UN), New York.
For primary bibliographic entry see Field 6B.
W76-01818

STORM RUNOFF IN THE VICINITY OF OAK RIDGE, TENNESSEE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2A.
W76-01841

A WATERSHED SOILS INDEX OF RUNOFF POTENTIAL,
Agricultural Research Service, Coshocton, Ohio.
For primary bibliographic entry see Field 2G.
W76-01848

PERFORMANCE CONTROLS FOR SENSITIVE LANDS: A PRACTICAL GUIDE FOR LOCAL ADMINISTRATORS,
American Society of Planning Officials, Chicago, Ill.
For primary bibliographic entry see Field 6F.
W76-01871

RECENT DEVELOPMENTS IN WATER DISTRIBUTION AND APPLICATION WITH SPECIAL REFERENCE TO SPRINKLER IRRIGATION,
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany). Dept. of Plant Production in Tropical and Subtropical Countries.
For primary bibliographic entry see Field 3F.
W76-01887

AQUATIC HERBICIDES AND THE CONTROL OF WATER WEEDS,
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5G.
W76-01911

PINE ASSOCIATIONS OF THE DERNOVICH STRETCH OF THE PRIPYAT RIVER FLOODPLAIN, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralyn Botanichny Sad.
For primary bibliographic entry see Field 2I.
W76-01918

4B. Groundwater Management

HIERACHICAL MANAGEMENT OF GROUND AND SURFACE WATER SYSTEM VIA MULTICELL APPROACH,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4A.
W76-01501

HYDROGEOLOGY OF GLACIAL DEPOSITS IN TIPPECANOE COUNTY, INDIANA, SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING WATER RESOURCES IN MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W76-01521

UNIQUENESS OF A MODEL OF STEADY-STATE GROUND-WATER FLOW,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W76-01526

USE OF DRAINAGE WELLS,
Bureau of Reclamation, Denver, Colo.
H. H. Ham.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. 8 fig, 12 ref.

Descriptors: *Drainage wells, Drainage sysems, Drainage practices, Drainage engineering, Flow systems, Transmissivity, *Subsurface drainage.
Identifiers: *Interfering wells.

Wells are often viewed as an alternative to drains for agricultural subsurface drainage. Where subsurface and other conditions are favorable, wells may offer advantages despite hydraulic and other shortcomings. However, areas of such favorable conditions are limited. Furthermore, improper use of wells may jeopardize long-term productivity of the land. Use of wells for agricultural subsurface drainage may appear advantageous but should be

approached with caution unless investigations have determined that conditions are favorable. (Skogerboe-Colorado State)
W76-01566

PRODUCTION OF SUPERHEATED STEAM FROM VAPOR-DOMINATED GEOTHERMAL RESERVOIRS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 3E.
W76-01587

GROUND WATER IN SELECTED AREAS IN THE KLAMATH BASIN, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2F.
W76-01590

INTERCEPTING TRENCH AT A LANDFILL RENDERS LEACHATE INTO DRINKABLE SOURCE OF WATER,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-01627

EVALUATION OF GEOTHERMAL ACTIVITY IN THE TRUCKEE MEADOWS, WASHOE COUNTY, NEVADA,
Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-01683

GROUNDWATER MANAGEMENT AND SALINITY CONTROL: A CASE STUDY IN NORTHWEST MEXICO,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
J. W. McFarland.
American Journal of Agricultural Economics, Vol 57, No 3, p 456-462, August, 1975. 1 tab, 16 ref.

Descriptors: *Water management(Applied), *Salinity, *Groundwater resources, *Water supply, *Groundwater mining, *Mexico, *Saline soils, *Aquifer management, Water resources, Aquifers, Groundwater, Groundwater basins, Water policy, Water resources development, Groundwater recharge, Water utilization, Water wells, Withdrawal, Hydrogeology, Safe yield, Forecasting, Water allocation(Policy), Saline water intrusion, Irrigation, Leaching.
Identifiers: Sahuaral Irrigation District(Mexico).

The Sahuaral Irrigation District in Mexico, located approximately 200 miles south of the Arizona-Mexico border, is studied with respect to policy issues associated with the management of the coastal groundwater aquifer and soil salinity. The primary policy issues are the time related rate of use of groundwater supply, the allocation of water between irrigation and leaching, and the selection of crops. In order to give operational form to these problems, a management model, in dynamic programming format, is used which indicates that the aquifer should be mined at a rapid rate near the beginning of the planning horizon, gradually decline through time, and converge to safe yield after 29 years. In addition, more water should be allocated to leaching to maintain soil salinity at lower levels. (Robinett-Arizona)
W76-01695

SOUTH PLATTE RIVER FLOW CORRELATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-01699

USE OF TEST WELLS AS WATER-QUALITY PREDICTIONS,
Wisconsin Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W76-01768

THE SIGNIFICANCE OF HYDROGEN SULFIDE IN GROUNDWATER,
For primary bibliographic entry see Field 5B.
W76-01781

STOCHASTIC MODELS FOR GROUND WATER LEVELS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
R. A. Rao, R. G. Rao, and R. L. Kashyap.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 411, $5.50 in paper copy, $2.25 in microfiche. Purdue University Water Resources Technical Report No 67, August, 1975. 84 p, 21 fig, 17 tab, 20 ref, append. Partial Completion Report, OWRT C-3277(3713) (9).

Descriptors: *Groundwater, *Water table, *Stochastic processes, Statistical models, Surface-groundwater relationshps, Groundwater movement, City planning, Community development, Model studies, Water levels, Water level fluctuations, Aquifers.

The ground water level fluctuations in an aquifer are affected by external causes such as precipitation, outflows from the aquifer, and pumping from the aquifer. Stochastic models are proposed for the fluctuations in ground water levels. Both multiinput-single output and multivariate models have been considered. IN th univariate models, variables such as precipitation, stream flows and others which have been known to affect the ground water levels have been considered as external inputs. The fluctuations in ground water levels and the causal variables are directly built into the multivariate model. The parameter estimation and the residual tests are discussed in detail. The multivariate model was also tested by simulation. The results indicate that the ground water level series can be successfully modeled by stochastic models. These models can be used to evaluate the time lag between precipitation and changes in ground water levels, the effect of the streamflows on water levels in adjacent wells, and the ground water resources in a region. (See also W76-01798)
W76-01799

CYCLIC STORAGE OF FRESH WATER IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
O. K. Kimbler, R. G. Kazmann, and W. R. Whitehead.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 426, $6.00 in paper copy, $2.25 in microfiche. Louisiana Water Resources Research Institute, Baton Rouge, Bulletin 10, October 1975, 78 + 52 p, 27 fig, 21 tab, 45 ref, 6 append. OWRT A-022-LA(6) and ORT A-027-LA(6).

Descriptors: *Underground storages, *Water storage, Groundwater recharge, Groundwater movement, Artificial recharge, *Saline water-freshwater interfaces, *Mixing, *Diffusivity, Dispersion, Transmissivity, *Injection, *Injection wells, Model studies, Computer programs, Aquifers, *Water movement(Applied).
Identifiers: Dispersivity, Gravitational laydown, Miscible displacement, Salaquifers, Isopotential zones, Zones of stagnation, Well-field design, Miniaquifers.

The storage of fresh water in horizontal, confined saline aquifers is technically feasible. Experimental results with physical aquifer models involving single and multiple injection/production wells were used to verify computer programs for: prediction of the recovery efficiency (the ratio of retrieved-to-injected fresh water); frontal position of the fresh water bubble; position of the saline water-freshwater interface resulting from gravitational laydown, dispersion, and mixing; and calculation of the dispersivity. For salaquifers with pre-existing groundwater movement, an additional program must be used to design a system of injection/withdrawal bounding wells that will neutralize the movement and create a zone of stagnation for the storage project. Tests on tilted physical systems, with and without pre-existing flow, showed that deleterious mixing and water movement could occur in aquifers with more than a few degrees of dip. Besides the determination of the usual in-situ hydrogeologic factors for groundwater supply systems, additional tests for porosity, dispersivity, and pre-existing flow are required for the design of an Injection/Storage/Production well field. Each additional I/S/P cycle will result in inproved recovery efficiency, regardless of the hydrogeologic parameters. All necessary computer programs are detailed in the appendices. Cost estimates for a hypothetical underground storage system compare favorably to an alternate tank storage project. The construction and calibration of the miniaquifers (artificial porous sandstones composed of uniformly-graded sand and epoxy resin) are described along with the test procedures, equipment, and mathematical bases.
W76-01811

DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING THERMAL INFRARED IMAGERY,
Alabama Univ., Huntsville. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-01840

BI-LEVEL SUBSURFACE DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W76-01847

OPTIMUM DESIGN OF DUG-WELLS IN HARD ROCK TERRAINS,
Osmania Univ., Hyderabad (India). Dept. of Geology.
For primary bibliographic entry see Field 8E.
W76-01892

INTEGRATING GROUND AND SURFACE WATER USE IN AN APPROPRIATION STATE,
Davis, Graham and Stubbs, Denver, Colo.
W. A. Hillhouse, II.
Rocky Mountain Mineral Law Institute Annual, Vol 20, p 691-720, 1975. 30 p, 71 ref.

Descriptors: *Colorado, *Alluvial acquifers, *Groundwater, *Surface-groundwater relationships, *Water allocation(Policy), Surface waters, Irrigation practices, Irregation programs, Preferences(Water rights), Planning, Supply, Water demand, Water rights, Appropriation, Regulation, Legislation.
Identifiers: *Alluvial wells, Non-governmental mechanisms.

Colorado has recognized the need for integrating regulation of ground and surface water use into a single legal system which protects appropriated water rights and encourages maximum utilization of the state's water resources. A persistent problem is that of reconciling the rights of groundwater users with those of more senior subsurface water oppropriators. Groundwater sources for irrigation are preferred by most farmers. A central concept in the 1969 Water Right Determination and Administration Act is that groundwater diver-

sions should not be curtailed unless the water would otherwise have been available to senior appropriators. The Act also provides for three devices available to private parties: the use of wells as alternate points of diversion for surface rights, the use of substituted supplies of water, and the use of plans for augmentation of current water supplies. Regulation of alluvial wells was begun by the State Engineer. Current rules which have withstood court challenges provide for gradual curtailment of groundwater diversion unless the appropriator can insure replacement to the stream of the appropriated water. This approach mitigates the problem of the anticipatory call. The problem of measuring the amount of replacement water required remains unsolved. (Jenkins-Florida)
W76-01960

KUIPER V. LUNDVALL (DEFINING GROUNDWATER AS NON-TRIBUTARY IN CHARACTER).
For primary bibliographic entry see Field 6E.
W76-01998

4C. Effects On Water Of Man's Non-Water Activities

EVALUATION OF THE EFFECTS OF URBANIZATION ON AQUATIC ECOLOGY AND HYDROLOGIC REGIMES.
Hydrocomp, Inc., Palo Alto, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-095, $6.75 in paper copy, $2.25 in microfiche. Completion Report, July 1975, 159 p, 53 fig, 27 tab, 9 ref. OWRTC-5103(NO. 4203)(1).

Descriptors: *Urbanization, *Water pollution, *Runoff, Floods, Low flows, Biochemical oxygen demand, Dissolved oxygen, Model studies, Storm runoff, Water quality, Simulation analysis, Maryland, Colorado, Washington.
Identifiers: Patuxent River(Md), Cherry Creek(Colo), Issaquah Creek(Wash).

Three hypothetical watersheds, each 60 sq. mi. in area with the downstream 30 sq mi urbanized were simulated with and without urbanization. Each watershed was assumed to have the hydrometeorologic, topographic, soils and vegetation characteristics of a real watershed--only the size and urbanization were assumed fixed. The real watersheds which defined the watershed characteristics wer Issaquah Cr. near Issaquah, Washington; Cherry Cr. near Franktown, Colorado and Western Branch, Patuxent River near Largo, Md. Frequency of peak flows, total annual runoff, flow duration data for 1-day and 21-day intervals, annual mass discharge of B.O.D., and frequency of occurrence of various levels of B.O.D. and dissolved oxygen concentrations were simulated for each watershed with and without urbanization to illustrate the impact of urbanization on the stream hydrology and water quality for each of the three sets of watershed characteristics. The conclusions as to the impact of urbanization are discussed and the three areas are compared.
W76-01514

ESTIMATION OF THE DISRUPTIVE IMPACT OF SNOWFALLS IN URBAN AREAS,
Queensland Univ., Brisbane (Australia). Dept. of Geography.
C. R. de Frietas.
Journal of Applied Meteorology, Vol 14, No 6, p 1166-1173, September 1975. 2 fig, 6 tab, 13 ref.

Descriptors: *Snowfall, *Cities, *Hazards, *Canada. Snow, Snow removal, Transportation, Snow management, Social impact, Economic impact, Winds, Wind velocity, Temperature, Meteorology.
Identifiers: *Disruptive impact.

Study aims were the identification and evaluation of the physical characteristics of snowfall and accompanying weather conditions contributing to a description of the disruptive capacity of snowfalls in urban areas. The study focused on five large urban areas of Canada, but it was hoped that the findings would have much wider application. Stepwise multiple regression analysis was applied to a sample of snow season data to reduce the number of variables needed to describe disruptive impact meteorologically. This was combined with a synoptic diagnosis of daily weather phenomena. Specifically, the results indicated that the disruptive intensity of a snowfall event may be expressed by a minimum of three independent meteorological elements, namely, 24-hour snow accumulation and mean wind speed and temperature during the period of fall. (Sims-ISWS)
W76-01859

4D. Watershed Protection

THE RIVER'S REACH: AN ASSESSMENT OF EXISTING FLOOD PROTECTION IN UPSTREAM WATERSHEDS OF THE CONNECTICUT RIVER BASIN.
Soil Conservation Service, Durham, N.H.
For primary bibliographic entry see Field 4A.
W76-01592

CONSERVATION OF SEDIMENT IN IRRIGATION RUNOFF,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
C. W. Robbins, and D. L. Carter.
Journal of Soil and Water Conservation, Vol 30, No 3, p 134-135, May-June, 1975. 3 fig.

Descriptors: *Irrigation water, *Sediment control, *Sediment yield, *Irrigation effects, *Return flow, Sediment load, Soil conservation, Agriculture, Sediments, Erosion, Sedimentation rates, Sedimentation, Deposition(Sediments), Farm ponds, Water pollution sources, Irrigation, Irrigated land, Surface irrigation, Water reuse, Topsoil, Surface runoff, Soil surfaces, Soil management.

Sediment carried in irrigation return flow usually is considered a pollutant, but small watersheds and drainage basins contain many areas where sediment can be removed from the water and used as an economical source of high quality topsoil for filling low areas and leveling land. Experiments were carried out to determine water flow and sediment deposition in a 1.1-acre pond specifically constructed to trap sediment in a low area near an irrigation return drain. During 1972, 167 acre-feet of water passed through the pond depositing 1,254 tons of sediment (7.51 tons per acre-foot of runoff water or 8.4 acre-inches of topsoil). Between April 29, 1973, and July 8, 1973, 185 acre-feet of water deposited an additional 1,379 tons of sediment (7.45 tons per acre-foot of runoff water). The average elevation for the pond was raised 16 inches, and 85 percent of the sediment in the runoff water was removed when the sediment concentration exceeded 0.1 percent by weight. Trapping sediments in man-made ponds must be considered a short-term measure. Solution of the sediment problem over the long term depends on effective conservation treatment at the sediment source. (Robinett-Arizona)
W76-01693

EROSION EVALUATION STUDY,
Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
For primary bibliographic entry see Field 2J.
W76-01829

A WATERSHED SOILS INDEX OF RUNOFF POTENTIAL,
Agricultural Research Service, Coshocton, Ohio.
For primary bibliographic entry see Field 2G.
W76-01848

SOIL-GEOMORPHIC RELATIONSHIPS IN A FIRST-ORDER VALLEY IN CENTRAL NEW YORK,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-01855

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

IMPLEMENTATION OF A N. P. D. E. S. DATA MANAGEMENT SYSTEM,
Krannert School of Industrial Management. Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01502

ESTIMATION OF URBAN STORMWATER QUALITY IN KALIHI STREAM DRAINAGE BASIN, OAHU, HAWAII,
Hawaii Univ., Honolulu, Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W76-01525

INDUSTRIAL POLLUTION OF THE LOWER MISSISSIPPI RIVER IN LOUISIANA.
Environmental Protection Agency, Dallas, Tex. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-01532

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-01577

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES. LEG 15,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2J.
W76-01581

LIQUID CHROMATOGRAPHIC ANALYSES IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
G. Chesters, and D. A. Graetz.
In: 'Chromatographic Analysis of the Environment,' Robert L. Grob, editor. Marcel Dekker, Inc., New York, N. Y., 1975. p 293-324. 1 fig, 4 tab, 102 ref.

Descriptors: *Analytical techniques, *Chromatography, *Soils, *Distillation, Pesticide residues, Humus, Separation techniques, Fulvic acids, Humic acids, Colloids, Carbohydrates, Organophosphorus pesticides, Chlorinated hydrocarbon, Triazine pesticides, *Pollutant identification.
Identifiers: *Liquid chromatography, Gel filtration, Waxy components.

The limited applications of liquid chromatography (LC) to soils stems largely from the poor resolution that can be achieved by this method and to the fact that no satisfactory detection systems for the column eluent have so far been devised. Informa-

tion on soil sampling and techniques used are reviewed. Since the major use of LC is as a cleanup technique, separation of interferences and concentration techniques as related to humic and fulvic acids, centering on Sephadex gel filtration columns (to provide a fractionation based on molecular weight) is discussed. Phosphorus compounds in soils are most often fractionated by paper or anion-exchange chromatographic methods but column chromatographic methods have been used occasionally in conjunction to separate organic phosphorus from excess salts prior to quantitative estimation of ribonucleic acid phosphorus by anion-exchange chromatography. Hydrolyzates of soil extracts containing carbohydrates have been purified and fractionated by a variety of LC procedures, as applicable to results required. LC is particularly well suited for cleanup of highly pesticide contaminated materials, such as soil extracts and it has been used extensively for cleanup of biological and soil extracts containing organochlorine and organophosphorus insecticides and herbicides. Trade and chemical names of the pesticides discussed and systems used are given. (Auen-Wisconsin)
W76-01636

PAPER CHROMATOGRAPHIC ANALYSIS IN AIR POLLUTION,
Wisconsin Univ., Madison. Water Resources Center.
G. Chesters, and D. A. Graetz.
In: 'Chromatographic Analysis of the Environment,' Robert L. Grob, editor. Marcel Dekker, Inc., New York, N.Y., 1975, p 179-192. 62 ref.

Descriptors: *Analytical techniques, *Chromatography, *Air pollution, Aromatic compounds, Organic compounds, Alcohols, Phenols, *Pollutant identification.
Identifiers: *Paper chromotography, Polynuclear aromatic hydrocarbons, Carbonyl compounds.

Paper chromatography (PC) has not been applied extensively to air pollutants; the majority of the literature deals with the separation and identification of polynuclear aromatic hydrocarbons. Specific sampling techniques and the sensitivity of particular methods are discussed. Organic contaminants are among the major components of atmospheric pollution and the polynuclear aromatic hydrocarbons have been of greatest concern because several display carcinogenic properties. Acetylated PC has also been used in analyzing polynuclear aromatic hydrocarbons in tobacco smoke, automobile exhausts, and polluted air with excellent resolution of closely related compounds. PC has been used for the separation and identification of the 2,4-dinitrophynylhydrazones of aldehydes and ketones; by quantitative conversion of carbonyls to their 2,4-dinitrophynylhydrazone derivatives, satisfactory separation of carbonyl compounds in air, cigarette smoke and car exhaust samples can be achieved. PC for separating volatile aliphatic alcohols as their 3,5-dinitrobenzoate derivatives is described. Aliphatic amines have been identified by gas chromatography as to their benzamides with excellent resolution. For qualitative analysis and for purification of samples the PC technique has proved useful but because of the low carrying capacity of paper, the method is restricted as a quantitative technique. (Auen-Wisconsin)
W76-01637

PAPER CHROMATOGRAPHIC ANALYSIS IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
G. Chesters, and D. A. Graetz.
In: 'Chromatographic Analysis of the Environment,' Rober L. Grob, editor. Marcel Dekker, Inc., New York, N.Y., 1975, p 325-375. 4 tab, 311 ref.

Descriptors: *Analytical techniques, *Chromatography, *Soils, Humus, Carbohydrates, Amino acids, Pesticides, Inorganic compounds, Chlorinated hydrocarbon, Organophosphorus pesticides, Insecticides, Herbicides, *Pollutant identification.
Identifiers: *Paper chromatography.

For analyses of indigenous soil components perhaps the most extensive qualitative use of paper chromatography (PC) is for determination of amino acids, but this form of analysis has been superceded largely by column ion-exchange chromatography. For pesticide analyses of soil and sediment extracts, paper chromatography serves for cleanup of samples prior to determination by some other analytical method; semiqualitative determination of pesticides in soil and sediment extracts; indentification of intact pesticides, and identification of unknown metabolites and other pesticide degradation products; and screening tests for possible pesticidal contamination of soils and sediments. However, the method possesses the disadvantage of being too tedius and time consuming for routine analysis and gas chromatography has proved to be more efficient. PC still possesses utility for separating multiple-component systems and for identifying unknown components, particularly when it is implemented by other methods. In the determination of inorganic compounds in soils, developments in PC methodology continue to be made; however, widespread environmental use of this tehcnique for determining toxic elements is unlikely, particularly for those metal ions capable of forming volatile coordination complexes. The methods and uses of PC analysis in humic materials and their degradation products, carbohydrates, organic phosphates, amino acids, pesticides, and inorganic components are described. (Auen-Wisconsin)
W76-01638

ELECTROCHEMICAL DETECTION OF NH4 PLUS NH3 SYSTEMS IN WATER,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
American Society for Testing and Materials, Special Technical Publication 573, p 20-24, 1975, 1 fig, 6 ref.

Descriptors: *Ammonia, *Analytical techniques, *Electrodes, Measurement, *Pollutant identification, *Electrochemistry, Water analysis, Chemical analysis.

Ammonia determination by conventional colorimetric methods or distillation normally yields total ammonia concentration in water samples. It is however, the unionized free ammonia that exerts adverse physiological or histopathological effects on fish as the threshold lethal concentration-50 is 0.2 mg/l ammonia. Free unionized ammonia concentrations depend on sample pH and temperature and can be calculated from ionization constants for different temperatures. Total, ionized, and unionized ammonia can be directly measured as ammonium ion with a univalent (monovalent) cation electrode; unionized free ammonia using a membrane-type ammonia electrode (ammonia probe); and total ammonia using a membrane-type ammonia electrode after converting ammonium ion to ammonia by alkalization of the sample to about pH 12. Specific ion electrodes are not as accurate as spectrophotometric ammonia determinations below 1 mg/l, but at higher concentrations they do not require sample dilution, are faster, and the sample volume is minimal. Continuous monitoring and signaling of dangerous ammonia levels would be possible. Glass electrodes are less expensive, specific, versatile, and faster than ammonia probes but are limites to waters with low, constant potassium and sodium ion background. Both electrodes can be used simultaneously in the same or a continuous sample, since no pretreatment is needed. (Buchanan-Davidson--Wisconsin)
W76-01652

A CURRICULUM ACTIVATIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES, APPENDICES, VOLUME 2.
Environmental Protection Agency, Washington, D.C. Training Grants Branch.
For primary bibliographic entry see Field 5G.
W76-01660

POTENTIOMETRIC TITRATION BEHAVIOR OF SODIUM SULFIDE, METHYL MERCAPTAN, DIMETHYL SULFIDE, DIMETHYL DISULFIDE AND POLYSULFIDES IN MIXED ALKALINE SOLUTIONS AND SULFATE PULPING BLACK LIQUORS,
Borden Chemical Co., New Westminster (British Columbia).
S-T. Chlu, and L. Paszner.
Analytical Chemistry, Vol 47, No 12, p 1910-1916, October, 1975. 7 fig, 5 tab, 30 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Analytical techniques, Pollutant identification, Sulfite liquors.
Identifiers: *Potentiometric titration.

Current regulations on water and air pollution abatement necessitate the development of accurate and rapid analytical techniques for estimating treatment requirements for discharged pollutants. Potentiometric titration curves were obtained for two polysulfide and four sulfate black liquors. Potentiometric titration of mercaptan fortified sulfate black liquors produced three inflection points. The first potential drop was due to monosulfide, the second was due to organic/inorganic polysulfide (bound mercaptan), and the third to ionized free mercaptan. Most of the mercaptide ion in normal mill run black liquor is bound by traces of elemental sulfur to form organo-polysulfide which contributes to the potentiometric titration. This increases the difficulty involved in the determination of methyl mercaptan by potentiometric titration. Correct interpretation of the titration curves is critical to the success of sulfide analysis of black liquors. Thiolignin had no measurable effect on the results of potentiometric titration of sulfides in black liquors. The partial abatement of air pollution from the sulfate pulping process can be achieved by periodically adding an excess of elemental sulfur to keep the ratio of elemental sulfur to mercaptide sulfur greater than one throughout the cooking stage. (Orr-FIRL)
W76-01670

HEAVY METAL (CU, PB, ZN, CD, NI, AS, HG) ADDITIONS TO SURFACE WATERS, STREAMS SEDIMENTS AND SELECTED AQUATIC LIFE IN THE MERAMEC PARK RESERVOIR DRAINAGE BASIN, MISSOURI,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W76-01686

STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY AND TEMPERATURES,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 2K.
W76-01716

ENVIRONMENTAL CHEMISTRY IN THE NETHERLANDS,
Waterloo Univ. (Ontario). Dept. of Chemistry.
F. W. Karasek, and O. Hutzinger.
Research/Development, p 40-46, September, 1975. 4 fig.

Descriptors: *Water pollution control, *Foreign research, *Education, Research and development, Analytical techniques, Pollutant identification, *Chemistry.

Identifiers: *Netherlands, Environmental chemistry.

Although, in most countries, environmental control programs are focused on monitoring and testing pollutants, the Netherlands has expanded its research to environmental chemistry. Highly industrialized, small and densely populated, the Netherlands has managed to limit the number of industrialized areas by means of good land management and a growing fight against present and potential problems. Research has been mainly conducted in government laboratories and secondarily in some universities. Now, however, academics are playing an increasingly important role. Many universities have programs in the environmental sciences although only the University of Amsterdam has a graduate program leading to a degree in environmental chemistry. Some departments participate in government sponsored interdisciplinary studies which include environmental chemistry. Course work for the latter is broad while student research projects are highly specific. Research in environmental chemistry involves finding and identifying a great number of complex and changing organic compounds many of which are found in complex environmental milieux and in quantities of a nanogram and picogram dimension. Improved analytic procedures are being evolved for such compounds. (Waltner-FIRL)
W76-01734

A TRIAL OF APPLICATION OF A IONOSELECTIVE ELECTRODE FOR NITRATE DETERMINATION IN SANITARY-HYGIENIC EXAMINATIONS OF WATER (PROBA ZASTOSOWANIA ELEKTRODY JONOSELEKTYWNEJ DO OZNACZANIA AZOTANOW W SANITARNYM BADANIU WODY),
K. Nowak, and J. Luczak.
Roczniki Panstwowego Zakladu Higiency, Vol 26, No 3, p 401-405, 1975, 1 fig, 1 tab, 6 ref.

Descriptors: *Pollutant identification, *Analytical techniques, Colorimetry, Electrodes, Nitrogen, Public health, Selectivity, *Nitrates.

Two methods for the determination of nitrate-nitrogen in water, the colorimetric method and a ionoselective nitrate electrode technique, were comparatively investigated. The results of measurements by both methods were in the closest agreement in the range of nitrate-nitrogen concentration greater than 1.0 mg/liter. This range is particularly important for the public health specialist. (Orr-FIRL)
W76-01751

THE CHEMICAL COMPOSITION OF THE UPPER LAYER OF SAPROPEL FROM THE VIITNA LAKES, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
For primary bibliographic entry see Field 2H.
W76-01753

CHARACTERIZATION OF AROMATIC HYDROCARBONS (CHARAKTERISIERUNG AROMATISCHER KOHLENWASSERSTOFFE),
W. Giger, M. Reinhard, and C. Schaffner.
Vom Wasser, Vol 43, p 343-358, 1974. 7 fig, 1 tab, 10 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Oil wastes, Aromatic compounds, Sewage, Fuels, Water pollution sources, Industrial wastes, Computers, Gas chromatography, Mass spectometry.
Identifiers: *Aromatic hydrocarbons.

Aromatic hydrocarbons are known to be common environmental pollutants. It is usually difficult if not impossible to establish the origin of these hydrocarbons. Their source may be spills of fossil fuels or fallout of incompletely combusted organic material, or wastes from trade and industry. Analytical methods for detecting aromatic hydrocarbons are outlined. A detailed discussion is presented on a method based on a combined system of gas chromatography and mass spectrometry. The data handling for this technique is performed by an on-line coupled computer. Domestic sewage, diesel fuel, and sediment recently contaminated by oil were analyzed by this method. An extensive characterization of the aromatic hydrocarbon mixtures in sewage and sediment samples permits the identification of their origin. (Orr-FIRL)
W76-01754

A NEW METHOD FOR DETERMINATION OF ORGANICALLY BOUND CARBON IN WATER BY PHOTOCHEMICAL OXIDATION (EIN NEUES VERFAHREN ZUR BESTIMMUNG VON ORGANISCH GEBUNDENEM KOHLENSTOFF IN WASSER DURCH PHOTOCHEMISCHE OXIDATION),
P. Woelfel, and H. Sontheimer.
Vom Wasser, Vol 43, p 315-325, 1974, 7 fig, 11 ref.

Descriptors: *Organic compounds, *Dissolved solids, *Analytical techniques, Ultraviolet radiation, Irradiation, Oxidation, *Pollutant identification, Rates.
Identifiers: *Photochemical oxidation, Organic carbon, Oxidation rates.

Dissolved organic carbon may be determined by a new method presented. Organic carbon compounds are oxidized at 40 C by means of ultraviolet radiation. The radiation source is a special low-pressure mercury lamp, which is submerged in the reactor. The instrument is sensitive enough to detect 0.001 mg of dissolved organic carbon in one liter of water. Each analysis provides a characterization of the particular organic material of the sample, because of the different rates of oxidation of various organic substances. (Kramer-FIRL)
W76-01756

OBSERVATIONS ON THE ASSOCIATION BETWEEN MERCURY AND ORGANIC MATTER DISSOLVED IN NATURAL WATERS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
A. W. Andren, and R. C. Harriss.
Geochimica et Cosmochimica Acta, Vol 39, No 9, p 1253-1258, September, 1975. 3 fig, 1 tab, 38 ref.

Descriptors: *Mercury, *Salinity, *Organic matter, Fresh water, *Estuarine environment, Mississippi River, Florida, Dissolved solids, Analytical techniques, *Pollutant identification.
Identifiers: Fulvic matter, Organic carbon.

An investigation was made on the association of mercury with dissolved organic matter and the effect of salinity variations on the forms and transport of dissolved mercury from fresh water to marine environments. Samples of estuarine environments were taken from the Mississippi Delta and from the Florida Everglades. It was found that dissolved mercury in estuarine waters from these two areas is associated with dissolved organic matter which has the properties of fulvic matter found in soils. The role of methylmercury in the transport of dissolved mercury was insignificant in these estuarine streams. In the Mississippi River, most of the dissolved mercury and most of the dissolved organic carbon existed in the less than 500 molecular size cut-off fraction. Molecular size distribution for both organic carbon and mercury showed very little change across the salinity gradient. The Everglades waters, with a very high dissolved organic carbon content, may be partially regulated for dissolved mercury by coprecipitation with large organic molecules. From both observed and experimental evidence, it was indicated that mercury is not readily exchangeable from dissolved organic matter in the transition from fresh water to sea water. (Kramer-FIRL)
W76-01757

EVALUATION OF A SINGLE-STEP BACTERIAL POLLUTION MONITOR,
Millipore Corp., Bedford, Mass.
R. A. Cotton, K. L. Sladek, and B. I. Sohn.
Journal of the American Water Works Association, Vol 67, No 8, p 449-451, August, 1975. 4 fig, 3 tab, 6 ref.

Descriptors: *Membranes, *Filters, Water pollution, Statistical analysis, Bacteria, Monitoring, Sampling, Coliforms, *Pollutant identification.
Identifiers: *Bacterial pollution monitor, Millipore filters, Total-bacteria.

A single step bacterial pollution monitor is discussed and evaluated. This monitor is a self contained filtration unit, nutrient supply and incubation chamber, and, when immersed in water, samples a one ml aliquot. This was compared with standard membrane and filter techniques. Results with the new sampler compared favorably and were within statistical error of the standard tests. Statistical variations can be caused by the inherent randomness of sampling and by the variability of the test itself. This method of bacteriological testing can be useful when a simple, quick, and accurate test method is required. (Pinto-FIRL)
W76-01758

SOURCES OF POLLUTION FROM MILITARY INSTALLATIONS, PART II,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5B.
W76-01763

ANALYTICAL DETERMINATION OF ORGANIC CHLORO-COMPOUNDS BY TEMPERATURE-PROGRAMMED PYROHYDROLYSIS (ZUR ANALYTISCHEN ERFASSUNG ORGANISCHER CHLORVERBINDUNGEN MIT DER TEMPERATURPRO-GAMMIERTEN PYROHYDROYSE),
W. Kuehn, and H. Sontheimer.
Vom Wasser, Vol 43, p 327-341, 1974. 6 fig, 4 tab, 19 ref.

Descriptors: *Pollutant identification, *Analytical techniques, Organic compounds, Adsorption, Activated carbon, Phenols.
Identifiers: Chlorine compounds, Pyrohydrolysis.

A proposed method for the analytical determination of organic chloro-compounds is described. Termed pyrohydrolysis, this method detects the total amount of chloro-compounds adsorbed no activated carbon. Inorganic chlorides may be eliminated by washing with NaN03 solution. Besides measuring the total content of these organic compounds, the characterization of a specific composition may be found by measuring the desorption at different stages of temperature and time. Additionally, the mechanism of thermal decomposition of chloro-phenols on activated carbon was studied. (Kramer-FIRL)
W76-01766

SURVIVAL OF ENTEROBIRUSES ON VEGETABLES IRRIGATED WITH CHLORINATED OXIDATION POND EFFLUENTS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Food Engineering; and Technion Israel Inst. of Tech., Haifa. Dept. of Biotechnology.
For primary bibliographic entry see Field 5C.
W76-01767

USE OF TEST WELLS AS WATER-QUALITY PREDICTIONS,
Wisconsin Univ., Oshkosh. Dept. of Geology.
C. W. Fetter, Jr.
Journal of the American Water Works Association, Vol 67, No 9, p 516-518, September, 1975. 8 fig, 1 tab.

Descriptors: *Test wells, *Water quality, Drilling, Groundwater, Water wells, Well casings, Well screens, Casings, Grouting, Water pollution, Chemical analysis, Sodium, Chloride, Iron, Alkalinity, Specific conductivity, Pollutant identification.
Identifiers: *Water quality predictors, Long Island(NY).

Groundwater quality can vary from good to unacceptable over certain areas. The use of test wells as water quality predictors was studied. They can be especially useful in cased wells, where the majority of the expense lies in casing, the well screen, the gravel pack, the grouting, and the development. A test well, expensive as it may be, will be less expensive than the purification process that must be used on contaminated water. Another advantage is that the casing and screen for the test well can be used again in other test wells. The test wells discussed were built in Suffolk County on Long Island, where the groundwater can have large variations. The first stage in building a test well is drilling a test boring, either 12 in or 20 in in diameter. Core samples are taken and analyzed by a geologist every 10 or 20 feet. From the samples, the geologist will decide which zones or levels are suitable for testing. The hole is backfilled for the testing to take place. A complete chemical analysis is made on a sample of water taken from the well. Samples are analyzed for sodium, chloride, iron, hardness, alkalinity, and specific conductivity. In the eight test wells drilled on Long Island, the correlation with the permanent wells were excellent. Specific conductivity tended to be slightly higher in the permanent well than in the test well, as were concentrations of chloride, sodium, hardness and alkalinity, with very few exceptions. Iron tended to be less concentrated in the permanent well than in the test well. (Pinto-FIRL)
W76-01768

TRACE METALS IN MELBOURNE RIVERS-AN INTERLABORATORY ANALYSIS,
Materials Research Labs., Ascot Vale (Australia).
A. T. Phillip, R. W. Pettis, J. E. Harris, G. J. Fabris, and P. L. Boar.
Proceedings of the Royal Australian Chemical Institute, Vol 42, No 8, p 209-215, August, 1975. 1 fig, 5 tab.

Descriptors: *Analytical techniques, *Heavy metals, *Pollutant identification, Estuaries, Oceans, Rivers, Sampling, Laboratory tests, Copper, Lead, Cadmium, Toxicity.

Analytical techniques and procedures utilized in the study of trace metals in river estuarine and oceanic waters are reviewed. Three independent Melbourne (Australia) laboratories conducted the experiments. Copper, lead and cadmium were the selected trace metals because of their high toxicity to a large variety of aquatic and marine biota. River water samples were taken from the surface of the Yarra and Maribyrnong Rivers at three stations. Two sets of water samples were made at a fourteen day interval. The first set of samples was put directly into the receptacles without acid addition. Two of the laboratories determined total metal content while the third one determined the dissolved-metal content. The second set was immediately acidified when collected. All three laboratories determined total metal content. Experimental procedures are described. The overall mean concentrations found were: copper 6.9+ 1.5 microgram/liter, lead 5.4 +1.5 microgram/liter, and cadmium less than 0.5 microgram/liter. The results are comparatively similar to those found in various other streams in different parts of the world. These concentrations of the metals are considered to be below the safety level although they may be toxic to the more sensitive aquatic species. Further interlaboratory work is encouraged in order to establish accurate analytical procedures for trace metals and to further calibrate interlaboratory studies. (Waltner-FIRL)
W76-01770

THE EFFECTS OF OZONE DEODORIZATION EQUIPMENT FOR THE SEWAGE ODOR (GESUI SHUKI NI TAISURU OZON DASSHUSOCHI NO KOKA),
For primary bibliographic entry see Field 5D.
W76-01771

WASTEWATER SAMPLE PRESERVATION,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
A. Benedek, and A. Najak.
Water and Pollution Control, Vol113, No 9, p 20-24, 31, September, 1975. 36 ref.

Descriptors: *Preservation, *Waste storage, *Biochemical oxygen demand, *Chemical oxygen demand, Nitrates, Nitrites, Nitrogen, Ammonia, Phenols, Phosphorus, Analytical techniques, *Pollutant identification.
Identifiers: Sample freezing, Waste water samples, Acidification.

A summary is presented of sample preservation techniques for the major parameters of waste water, including BOD, COD, suspended solids, nitrates, nitrites, total nitrogen, ammonia, phenols, and phosphorus. The techniques are applicable in cases when waste water samples cannot be immediately analyzed. Because changes taking place in the samples are either biological or chemical, preservation serves to retard biological action, to inhibit precipitation and hydrolysis of chemical compounds, or to retard the volatility of various constituents. The physical methods commonly used are refrigeration or freezing. Several chemical methods are applicable, these are usually dependent upon the addition of metalbolism suppresents. Tables are presented for each of the major waste water parameters, with a brief discussion and recommendation for each. For BOD, freezing or refrigeration is recommended, and values will tend to be low. For COD, acidifcation with sulfuric acid or freezing is suggested. Suspended solids are not preserved well and immediate analysis is the best alternative. Preservation of nitrates may be accomplished by refrigeration plus sulfuric acid. Ammonia may be preserved by refrigeration plus the addition of not more than 40 mg/liter mercuric chloride. Nitrites, however, should be analyzed immediately. For phenols, the addition of one g/liter copper sulfate, and acidification to pH 2 to 2.5, followed by storage in glass bottles with immediate refrigeration is recommended. Phosphates may be preserved by acidification plus refrigeration, while total phosphorus is best kept by acidification and freezing. (Kramer-FIRL)
W76-01772

THE SIGNIFICANCE OF HYDROGEN SULFIDE IN GROUNDWATER,
For primary bibliographic entry see Field 5B.
W76-01781

WATER QUALITY STUDIES AND LAND-USE MAPPING USING ERTS-1 DATA,
Lund Univ. (Sweden). Dept. of Geography.
U. Hellden, and H-A. Olsson.
Journal of the British Interplanetary Society, Vol 28, No 9/10, September/October, 1975. 9 fig, 15 ref.

Descriptors: *Satellites(Artificial), *Monitoring, *Land use, *Pollutant identification, Oil spills, Lakes, Industrial wastes, Eutrophication, Sewerage, Water pollution sources.
Identifiers: LANDSAT, Sweden.

The use of ERTS-1 data for water quality studies and land-use mapping is discussed. In this application, sewage conditions of Copenhagen in the Oresund and 161 lakes in South and Middle Sweden were investigated. The effects of waste disposal from sewers on lake and Middle Sweden were investigated. The effects of waste disposal from sewers on lake eutrophication may be observed by satellite MSS images. Industrial pollution was also observed, including the discovery of a belt of oil pollution in the southern part of the Baltic. Circulation of polluted water due to municipal and industrial wastes was followed. A variation in reflectivity of a great number of the lakes was found, and significant regional differences were compared. Correlations between the satellite spectrophotometry measurements and in situ turbidity and transparency data were quite good. The MSS images of chlorophyllic (containing algae and plankton) water reflected most intensively within the band 0.4 to 0.6 micrometers and industrial water pollution reached highest reflection in the band 0.6 to 0.7 micrometers. It was thus shown that the channels most suitable for water quality detection are ERTS-1 MSS4 and MSS5. From the imagery data gathered, a detailed differentiation of land use for the coastal area of Sweden was prepared. (Kramer-FIRL)
W76-01792

ALARM SYSTEMS PROVIDE LOW COST ENVIRONMENTAL PROTECTION,
Beavin Co., Baltimore, Md.
For primary bibliographic entry see Field 5D.
W76-01795

OIL/WATER TANK CONTENT PROFILES,
Exxon Research and Engineering Co., Florham Park, N.J.
R. J. Skocypec.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-72 10540, $6.00 in paper copy, $2.25 in microfiche. Report EE.30TMR.71, December 1971. 127 p, 99 fig, 9 tab, 3 append. Department of Commerce C-1-35049.

Descriptors: *Water pollution, *Oil pollution, *Oily water, Ships, Profiles, Measurement, Sampling, Oil wastes, Oil industry, Oil-water interface, Oil.
Identifiers: *Ballast tanks, Oil tankers.

Static oil content profile data was compiled for ballast tanks aboard Esso tankers in dirty service. Dirty ballast tanks were found to contain a relatively clean bulk water phase with a surface oil layer of a few inches in thickness and an increased oil content near the botton of the tank about 40% of the time. The mean bulk oil contents of all the dirty ballast profiles showed a log-normal probability distribution with mean oil content of 18 ppm as both free and dissolved oil. Clean ballast tanks were found to be extremely clean with 50% of the profiles showing mean oil contents below 3 ppm. No obvious correlation between oil content and tank cleaning time could be detected. Little more than a sheen was usually detected at the surface. Slop tank profiles showed widely spread data ranging from a low of 30 ppm to high of 500 ppm oil. There was no apparent reason for this phenomenon and further investigation of slop tanks was recommended. Oil layer thicknesses were on the order of several feet. (Sims-ISWS)
W76-01837

FEASIBILITY OF REMOTE SENSING FOR DETECTING THERMAL POLLUTION--PART I: FEASIBILITY STUDY; PART II: IMPLEMENTATION PLAN,
Miami Univ. Coral Gables, Fa. Dept. of Mechanical and Industrial Engineering.
T. N. Veziroglu, and S. S. Lee.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-15199, $7.50 in paper copy, $2.25 in microfiche. Report NASA CR-134453, December 1973. 177 p, 9 fig, 6 tab, 42 ref, 2 append. NASA NAS10-8402.

Descriptors: *Remote sensing, *Thermal pollution, *Powerplants, Heated water, Temperature,

Salinity, Turbidity, Measurement, Instrumentation, Equipment, Pollutant identification, Satellites(Artificial), Aircraft, Water pollution, Path of pollutants, Water cooling, Thermal powerplants, Mathematical models, Model studies.

The problems associated with thermal pollution are compounded by recent trends of building more and larger nuclear power plants in order to meet the growing energy demand. The first part of the resort, covering the feasibility study, indicated that: (1) using passive remote sensing methods, today it is possible to detect water surface temperatures within plus and minus one degree with a resolution of 0.3 mile radius from spacecraft; (2) using active remote sensing methods, techniques and instruments could be developed for remote sensing of vertical temperature and turbidity distributions in oceans; and (3) it is feasible to develop a generalized three-dimensional model to predict the motion, temperature, and salinity of thermal plumes within waters to which they are discharged. The second part of the report, covering the implementation plans, included: (1) the development and testing of a universal analytical model to predict three-dimensional temperature and salinity distributions in coastal regions receiving hot discharges, (2) improving the accuracy of the thermal remote sensing systems, and (3) the development and testing of an active remote sensing system to measure the water tubidity. (Sims-ISWS)
W76-01838

EXTRACTION OF INFORMATION ON INORGANIC WATER QUALITY,
Bureau of Reclamation, Denver, Col. Water Quality Office.
W. L. Lane.
Colorado State University Hydrology Paper No 73, July 1975, 74 p, 44 fig, 32 tab, 87 ref. NSF GK-31512.

Descriptors: *Time series analysis, *Mathematical models, *Dissolved solids, *Water quality, *Salinity, *Conductivity, Streamflow, Hydrology, Water chemistry, Inorganic compounds, Pollutant identification.
Identifiers: Henry's Fork River(Utah), New Fork River(Wyo), Pecos River(NM), Saline River(Kan), Wind River(Wyo).

The potential for obtaining information concerning certain water quality variables on a stream by considering the relationships which exist between quality and quantity variables was examined. More precisely, the study was concerned with the relationship which exists between discharge and inorganic water quality in natural streams. Inorganic water quality was taken to refer to the concentrations of inorganic constituents found dissolved in the stream water. Natural streams were defined as those streams which are free of man's influence, although some compromise of this definition was necessary in actual application. The relationship studied was the negative correlation between inorganic water quality and discharge which is found in virtually all streams. Study was limited to 13 inorganic constituents. A relationship between constituent concentrations and conductivity based on chemical theory was developed and is applicable to any stream sample. Applications were made using data from five streams. (Lardner-ISWS)
W76-01844

FORMATION OF CLOUD AND ICE NUCLEI BY THE COMBUSTION OF CRUDE OIL,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
For primary bibliographic entry see Field 2B.
W76-01857

ACTIVITIES AND NEEDS RELATED TO RADIOACTIVITY STANDARDS FOR ENVIRONMENTAL MEASUREMENTS.
Oak Ridge National Lab., Tenn.
Environmental Protection Agency, Report EPA-670/4-75-006, June 1975. 55 p. 1HA327; ROAP 24AAK; Task 003.

Descriptors: *Radioactivity, *Radioisotopes, Monitoring, Measurement, *Quality control, *Radioecology, *Pollutant identification, Standards, Analytical techniques, Radioactivity techniques, Environmental techniques.
Identifiers: *Environmental radioactivity, Environmental monitoring, Radioactivity standards, Radioactive decay schemes.

A symposium was held to discuss the needs for radioactivity standards in environmental monitoring programs concerned with population radiation exposure. Papers were presented on 'Status of Decay Schemes,' 'Some Activities and Needs for AEC Regulatory in the Use of Radioactivity Standards,' 'Standards for Environmental Studies,' 'Program and Activities of the Quality Assurance Branch, NERC-Las Vegas,' 'Activities of Commercial Radionuclide Producers,' and 'Radionuclide Metrology and Quality Assurance.' The presentations indicated that numerous radioactivity standards and aids for correctly utilizing them were available. New needs, however, had arisen recently because lower levels of ambient radioactivity must be measured by many more groups due to requirements that population radiation exposure from nuclear power production be as low as practicable. Based on the presentations and resulting discussions, the following actions were recommended: (1) Establish a focal point for systematically planning activities to meet cited needs for decay schemes, specific standards, analytical methods, and quality assurance programs; (2) Develop a clear chain of traceability to the National Bureau of Standards; (3) Prepare guides for standardizing radiation detection and maintaining quality control; and (4) Train qualified analysts to obtain satisfactory analytical results. (EPA)
W76-01861

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON MANGANESE.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 291, $4.50 in paper copy, $2.25 in microfiche. Report EPA-600/6-75-002, April 1975. 56 p, 3 fig, 30 tab, 124 ref. 1AA001; ROAP No. 26AAA.

Descriptors: *Manganese, Reviews, Measurement, Evaluation, Control, Path of pollutants, Toxicity, Environment, Ecology, Air pollution effects.
Identifiers: Manganism.

A review and evaluation are presented of the current knowledge of manganese in the environment as related to possible deleterious effects on human health and welfare. Sources, distribution, measurement, and control technology are also considered. Manganese is associated with small particles in the air. Concentrations measured in ambient air averaged 0.1 microgram/cubic m3 (annual) with a maximum of 8.3 microgram/cubic m (annual) near a large source. In Norway, a form of pneumonia was attributed to airborne manganese in a community where concentrations were measured at 46 microgram/cubic m3. Manganese poisoning characterized by progressive central nervous system deterioration has occurred under occupational exposure but apparently not from atmospheric exposure. Control of fine particulate emissions should reduce manganese emission considerably. (EPA)
W76-01863

ANALYSIS OF HYDROCARBONS IN MARINE ORGANISMS: RESULTS OF IDOE INTERCALIBRATION EXERCISES,
Woods Hole Oceanographic Institution, Mass.
J. W. Farrington, J. M. Teal, J. G. Quinn, P. L. Parker, and K. Winters.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 459, $3.50 in paper copy, $2.25 in microfiche. Woods Hole Oceanographic Institution Contribution Number 3353, Sept, 1974. 10 p, 3 tab, 5 ref.

Descriptors: *Analytical techniques, *Organic compounds, *Pollutant identification, *Methodology, *Gas chromatography, Laboratory tests.
Identifiers: International Decade of Ocean Exploration, Intercalibration, Accuracy, Tissue analysis, Squalene, Pristane.

Intercalibration exercises conducted as part of the International Decade of Ocean Exploration's baseline studies of ocean pollutants provide an assessment of the precision and accuracy of analyses of marine organisms for hydrocarbons. No methods were specified for the analysis. In all cases, the hydrocarbons were separated from other lipids by column or thin-layer chromatography and then analyzed by gas chromatography. One intercalibration exercise involved the analysis of a tuna meal sample provided as a working intercalibration sample through the courtesy of the National Bureau of Standards. Three laboratories reported the sample as containing 29.5 to 49.0 micrograms of hydrocarbons not resolved by medium resolution gas chromatography columns/gram dry weight of tuna meal. These represent petroleum hydrocarbons by the gas chromatography criteria for a first screening of samples to detect petroleum hydrocarbons. Four laboratories reported pristane concentrations of 1.9, 3.0, 5.9 and 2.0 micrograms/gram dry weight of tuna meal. Results of analysis for individual n-alkanes are also reported. (Katz)
W76-01901

APPENDICES TO: SURVEY STUDY TO SELECT A LIMITED NUMBER OF HAZARDOUS MATERIALS TO DEFINE AMELIORATION REQUIREMENTS,
Little (Arthur D.) Inc., Cambridge, Mass.
W. L. Lyman, L. Nelson, L. Partridge, A. Kalelkar, and J. Everett.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A004 312, $11.75 in paper copy, $2.25 in microfiche. Prepared for: Department of Transportation, U.S. Coast Guard, Office of Research and Development, Washington, D.C. 20590, March 1974. 621 p.

Descriptors: *Hazards, Regulation, *Chemicals, *Standards, *Classification, *Safety, Pollutants, *Chemcontrol, Documentation, Water pollution sources, Water quality control, Evaluation, Pollutant identification.
Identifiers: *Amelioration requirements, Amelioration techniques, *Hazardous substances, Discharges, Risk analysis.

This is the appendix to a work which entailed the categorization of hazardous chemicals according to physical and chemical characteristics that were perceived to be important to the development of amelioration techniques. A total of 400 hazardous chemicals, deemed to encompass most of the critical chemicals in terms of quantity of shipment and the severity of the hazards presented, were associated with each of approximately 30 amelioration categories. A representative chemical was then selected for each category with the intent that it would provide the basis for searching for, evaluating, and developing amelioration methods from each category. The representative chemicals were chosen by assessing the chemical and physical behavior of the chemicals, risk indices, and other practical considerations. Existing response (amelioration) equipment and systems were then

reviewed to determine applicability to each representative chemical and its associate category. Once gaps and deficiencies were determined, conceptual response studies were initiated that resulted in a number of potential amelioration techniques that were considered to warrant USCG-sponsored research and development efforts.(Katz)
W76-01902

A COMPARISON OF FOUR SAMPLERS FOR BENTHIC MACROINVERTEBRATES INHABITING COARSE RIVER DEPOSITS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 7B.
W76-01909

CHEMICAL ANALYSIS OF TRACE ELEMENTS IN ICELAND GEYSIRS WITH REMARKS ON MASTIGOCLADUS LAMINOSUS COHN,
Copenhagen Univ. (Denmark). Inst. of Hygiene.
E. Fjerdingstad, K. Kemp, and E. Fjerdingstad.
Archiv fur Hydrobiologie, Vol 74, No 2, p 159-171, October 1974. 10 fig, 3 tab, 39 ref.

Descriptors: *Trace elements, *Algae, *Geysers, Thermal water, *Thermal springs, Spectroscopy, *Chemical analysis, Copper, Zinc, Manganese, Metals, Silica, Iron, Chlorine, Plant morphology, Hot springs, Cyanophyta, Methodology.
Identifiers: *Mastigocladus laminosus, *Transition metals, Bioaccumulation, *Iceland, Geysirs.

Water from Iceland geysers and the dominant thermal alga, Mastigocladus laminosus were investigated for trace elements. Great concentrations of Si, Ca, Fe and Cl were found in both water and algae. The accumulation factors for Cu, Zn, Mn and Ti were high in the algae, while small concentrations were found in the water. It is suggested that these transition metals are of vital importance to the organisms and are probably part of their enzymatic make-up. The morphology of the algae is discussed. (Katz)
W76-01912

TRACER EXPERIMENTS ON THE EFFECT OF MICRONUTRIENTS ON THE GROWTH OF PORPHYRA PLANTS-II MANGANESE-54 AND ZINC-65 ASSIMILATION IN RELATION TO ENVIRONMENTAL FACTORS,
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
For primary bibliographic entry see Field 5C.
W76-01916

A RESPIROMETER TECHNIQUE FOR EVALUATING THE POTENTIAL EFFECTS OF RAPID THERMAL CHANGES TO SMALL AQUATIC ORGANISMS,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
For primary bibliographic entry see Field 5C.
W76-01920

A SALINITY CONTROLLER FOR FLOW-THROUGH BIOASSAYS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
L. H. Bahner, and D. R. Nimmo.
Transactions of the American Fisheries Society, No 2, p 388-389, 1975. 2 fig.

Descriptors: *Design, *Methodology, Technology, *Bioassays, Flow systems, *Salinity, Water quality, Pesticides, Sea water, *Pollutant identification, *Bioassay, Instrumentation.
Identifiers: *Electro-Mechanical device.

An electro-mechanical device was constructed to monitor and dilute seawater to a constant salinity for flow-through bioassays. It was used successfully in pesticide bioassays and required little maintenance. (Klein)
W76-01929

AN ULTRAVIOLET SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF NAPHTHALENE AND ALKYLNAPHTHALENES IN THE TISSUES OF OIL CONTAMINATED MARINE ANIMALS,
Texas A and M Univ., College Station. Dept. of Biology.
J. M. Neff, and J. W. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 1, p 122-129, July 1975, 1 fig, 2 tab, 15 ref.

Descriptors: Methodology, *Analytical techniques, *Spectrophotometry, *Oil pollution, Organic compounds, *Marine animals, Animal physiology, Clams, Oysters, Mollusks, Technology, *Pollutant identification.
Identifiers: Ultraviolet spectrophotometry, *Naphthalene, Methylnaphthalenes, Dimethylnaphthalenes, Bioaccumulation, Tissue analysis, Crassostrea virginica, Rangia cuneata, *Alkylnaphthalenes.

A direct UV spectrophotometric method for the semiquantitative determination of naphthalene, methylnaphthalenes and dimethylnaphthalenes in oil polluted sea water and the tissues of marine animals is presented. Oysters, Crassostrea virginica, and clams, Rangia cuneata, were used. As little as 0.1 ppm of naphthalene and alkylnaphthalenes were detected in tissues. The detection limits in sea water ranged from 0.01 to 0.05 ppm. (Klein)
W76-01933

5B. Sources Of Pollution

CHEMICAL AND SEDIMENT BUDGETS FOR A SMALL TIDAL CREEK, CHARLESTON HARBOR, S. C.,
South Carolina Univ., Columbus. Dept. of Geology.
J. L. Settlemyre, and L. R. Gardner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-081, $4.50 in paper copy, $2.25 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No 57, May 1975, 56 p, 9 fig, 10 tab, 60 ref. OWRT B-055-SC(4).

Descriptors: *Tidal marshes, *Estuaries, *Sediments, *Water quality, Nutrients, Metals, Surfactants, Coliforms, Organic matter, *South Carolina, Harbors.
Identifiers: *Charleston Harbor(SC), Chemical budgets, Sediment budgets.

Chemical and sediment budgets based on discharge weighted composite samples of flood and ebb flow over 25 tidal cycles indicate that marshes export suspended organic matter and dissolved Si02, P04 and perhaps Fe. Inorganic sediment, surfactants and possibly coliform bacteria are imported and/or degraded. No significant net transport was detected for dissolved Cu, Zn or Pb. The methodology and results of the study are evaluated in terms of physical, chemical and biological processes operative in marshes and in terms of ecological constraints.
W76-01511

EVALUATION OF THE EFFECTS OF URBANIZATION ON AQUATIC ECOLOGY AND HYDROLOGIC REGIMES.
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4C.
W76-01514

THREE-DIMENSIONAL SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineering.
L. D. Spraggs, and R. L. Street.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-090, $10.00 in paper copy, $2.25 in microfiche. Technical Report No 190, August 1975, 327 p, 83 fig, 11 tab, 48 ref, 5 append. OWRT C-3033(No. 3675)(2).

Descriptors: *Thermal pollution, *Lakes, Computer programs, *Computer models, *Reservoirs, *Numerical analysis, Digital computers, *Simulation analysis, Circulation, Thermal stratification.

A study was undertaken to develop a three-dimensional numerical model for prediction of the temperature regime and energy transfers in bodies of water subjected to thermal loadings. The Navier-Stokes equations, a heat energy equation, a pressure equation and a continuity equation are nondimensionalized using three-characteristic length scales. Hence, all physical problems are treated numerically, and mathematically, inside a unit cube. The Boussinesq approximation is used for density variations. Sub-grid-scale turbulence simulation is used with an eddy viscosity hypothesis. The numerical model follows a Marker-and-Cell-style format in variable placement, etc., was coded in FORTRAN, and was implemented on IBM 360/168 and CDC/7600 computers. Many problems were successfully simulated, including laboratory tests with wind and in/out flows, and idealized lake forms.
W76-01518

ESTIMATION OF URBAN STORMWATER QUALITY IN KALIHI STREAM DRAINAGE BASIN, OAHU, HAWAII,
Hawaii Univ., Honolulu, Water Resources Research Center.
M. N. Nakamura, and R. H. F. Young.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 101, $4.00 in paper copy, $2.25 in microfiche. Technical Memorandum No 45, December 1974. 39 p, 8 fig, 16 tab, 41 ref. OWRT A-027-HI(4) 14-31-0001-3811.

Descriptors: *Storm runoff, *Pollutant identification, *Rainfall intensity, *Land use, Urbanization, *Drainage basin, Isohyets, *Hawaii, Estimating.
Identifiers: *Rainfall duration, Street wastes, Seasonal storm analysis, *Stormwater quality, Kalihi Stream drainage basin(Hawaii).

Urban runoff pollution potential can be linked to the constituents of street wastes as these wastes constitute the principal portion of runoff contaminants. This study was an attempt to correlate pollution associated with street litter with baseline quality data acquired in a previous study of Kalihi Stream. Correlations were made between street sweepings quality, length of street, land use, street surface characteristics, and rainfall intensity in order to estimate the concentration of pollutants in urban stormwater. The overall comparability of obtained estimated with existent stormwater quality data suggests the possibility of obtaining fairly acceptable quantification of pollution potential attributable to urban runoff by utilizing procedures described. However, the number of assumptions required leads to some inadequacies as reflected in inconsistencies in predicted BOD5 and COD levels with actual field data. The good correlation of population density-based formulae for street length with actual street lengths indicates a simple method for approximating street refuse pollution based on loadings per length of curb.
W76-01525

INDUSTRIAL POLLUTION OF THE LOWER MISSISSIPPI RIVER IN LOUISIANA.
Environmental Protection Agency, Dallas, Tex. Surveillance and Analysis Div.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-229 814, $6.75 in paper copy, $2.25 in microfiche. Report, April 1972. 146 p, 2 fig, 20 tab, 72 ref, 1 append.

Descriptors: *Industrial wastes, *Mississippi River, *Louisiana, *Water quality, Industrial plants, Industrial water, Industries, Water pollution, Water pollution sources, Water chemistry, Pollutants, Pollutant identification, Chemical wastes, Heavy metals, Toxicity, Organic compounds, Taste, Odor, Fish, Water quality standards, Water quality standards, Water quality control.
Identifiers: Carcinogenic compounds.

Waste waters from 60 industries discharging to the Mississippi River from the Baton Rouge area to its mouth have been analyzed and found to contain organic chemicals and toxic metals in high concentrations. Municipal water supplies were found to contain organic compounds in trace amounts which are believed to be the cause of the off-flavors in these supplies, and which may present a potential threat to the health and wellbeing of the consumers. Fish exposed to the river water developed objectionable tastes within seventy-two hours. Violations of taste and odor criteria in the river and in fish flesh were identified. Analytical techniques used were described in an appendix. (Sims-ISWS)
W76-01532

MERCURY DISTRIBUTION IN ANCIENT AND MODERN SEDIMENT OF NORTHEASTERN BERING SEA,
Geological Survey, Menlo Park, Calif.
C. H. Nelson, D. E. Pierce, K. W. Leong, and F. F. H. Wang.
Marine Geology, Vol 18, No 2, p 91-104, February, 1975. 5 fig, 4 tab, 27 ref.

Descriptors: *Mercury, *Sediments, *Alaska, Oceans, Beaches, Path of pollutants, Sediment distribution, Sampling, Core drilling, Evaluation, Geologic time, Pleistocene epoch.
Identifiers: *Bering Sea, Ancient and modern sediments.

Reconnaissance sampling of surface and subsurface sediment to a maximum depth of 80 m below the sea floor that typical values of 0.03 mg/litre and anomalies of 0.2-1.3 mg/litre mercury have been present in northeastern Bering Sea since Early Pliocene time. Values are highest in modern beach (maximum 1.3 and mean 0.22 mg/litre Hg) and nearshore subsurface gravels (maximum 0.6 and mean 0.06 mg/litre Hg) along the highly mineralized Seward Peninsula and in clayey silt rich in organic matter (maximum 0.16 and mean 0.10 mg/litre Hg) throughout the region. Although gold mining may be partly responsible for high mercury levels in the modern beach near Nome, Alaska (maximum 0.45 mg/litre), equally high or greater concentrations of mercury occur in buried Pleistocene sediments immediately offshore (maximum 0.6 mg/litre) and in modern unpolluted beach sediments at Bluff (maximum 1.3 mg/litre); this suggests that the contamination effects of mining may be no greater than natural concentration processes in the Seward Peninsula region. (Woodard-USGS)
W76-01586

AN INTRODUCTION TO THE PROCESSES, PROBLEMS, AND MANAGEMENT OF URBAN LAKES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2H.
W76-01588

THE MIGRATION OF FLY LARVAE (SIMULIIDAE) IN WATER WITH HIGH LEVELS OF TURBIDITY(IN RUSSIAN).
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 2I.
W76-01615

DEVELOPMENT AND ECOLOGY OF SKUJA IN THE SWEDISH LAKE TRUMMEN,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 2H.
W76-01621

INTERCEPTING TRENCH AT A LANDFILL RENDERS LEACHATE INTO DRINKABLE SOURCE OF WATER,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-01627

KINETICS OF LIMESTONE DISSOLUTION BY ACID WASTE WATERS,
Pennsylvania State Univ., University Park. Mineral Processing Section.
For primary bibliographic entry see Field 5D.
W76-01643

SOURCES AND DISTRIBUTION OF TRACE METALS IN AQUATIC ENVIRONMENTS,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
S. L. Williams, D. B. Aulenbach, and N. L. Clesceri.
FWI Report 74-25. 50 p, 27 tab, 8 ref, Published in 'Aqueous-Environmental Chemistry of Metals,' Alan J. Rubin, ed, Ann Arbor Science Publishers, Inc., Michigan.

Descriptors: *Path of pollutants, *Trace elements, *Metals, *Distribution, Geology, Titanium, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Soils, Rocks, Litter, Atmospheric fallout, Sediments, Precipitation(Atmospheric), Chemical reactions, Biochemistry, Surface waters, Hydrogen ion concentration, Urban runoff, Humus.
Identifiers: *Trace metals sources, Scandium, Vanadium.

Sources of trace metals (scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper and zinc) in aquatic environments are rocks, soil, and plant litter of drainage basins, dry and wet atmospheric fallout, and industrial and municipal discharges. Metal concentrations depend on the source and chemical and biological nature of receiving waters. Oligotrophic mountain lakes and streams generally contain more metals in surface waters than slower-moving waters with highpH and dissolved salt concentrations. The higher metal concentrations are usually due to larger quantities of humic substances which solubilize metals and to low quantities of dissolved salts which precipitate metals. Streams flowing through sedimentary limestone regions often pick up more metal by erosion or leaching than streams flowing over granite. High local metal concentrations often occur in eutrophic, polluted waters due to acid or strong reducing environments coupled with metal introduction from sediments exposed to reducing environments or from industrial and municipal discharges. High local metal concentrations decrease with distance from polluting source due to chemical and biological reactions. Metal concentrations in oligotrophic, eutrophic, and polluted rivers and lakes in the United States and foreign countries are given to illustrate their occurrence in surface waters. (Buchanan-Davidson--Wisconsin)
W76-01651

PERSISTENCE OF ENDOTHALL IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
G. V. Simsiman, and G. Chesters.
Water, Air, and Soil Pollution, Vol 4, p 399-413, 1975, 4 fig, 2 tab, 27 ref. OWRR B-016-WIS (17).

Descriptors: *Herbicides, *Aquatic environment, *Persistence, Microbial degradation, Pesticide removal, Dissolved oxygen, Aquatic weed control, Sediments, Pesticide kinetics, Adsorption, *Wisconsin.
Identifiers: *Endothall, Lake Mendota(Wis), Lake Tomahawk(Wis).

In a simulated lake impoundment, 72% of the added endothall persisted in the water for 30 days due to prolonged dissolved oxygen depletion resulting from weedkill. Endothall disappeared rapidly only after restoration of oxygenated and oxydizing conditions; under such conditions little or no endothall was detectable after 60 days. Degradation of endothall was slow in weed-free and quiescent sediment-waters containing abundant overlying water (200 ml water:5 ml sediment), even under aerobic conditions. Slow degradation was detected by the small amount of radioactive carbon dioxide evolution and persistence of intact endothall in the water after two months. When the water volume was reduced (20 ml water:5 ml sediment), there was a 25-fold increase in endothall degradation in Lake Mendota, Wisconsin, (a eutrophic hard-water lake). In Lake Tomahawk (an oligotrophic soft-water lake) degradation was slow, indicating that either the sediment contained low numbers of endothall-degrading microorganisms or rapid adsorption decreased herbicide availability for microbial decomposition. This study demonstrates that endothall--although degradable microbiologically--can persist in heavily weed-infested waters if anaerobiosis limits the activity of microorganisms. This may be a significant consideration when treating heavily weed-infested ponds or lakes into with endothall where complete stripping of DO is likely to occur. (Buchanan-Davidson--Wisconsin)
W76-01658

EVALUATION OF GEOTHERMAL ACTIVITY IN THE TRUCKEE MEADOWS, WASHOE COUNTY, NEVADA,
Nevada Univ., Las Vegas. Center for Water Resources Research.
R. L. Bateman, and R. B. Scheibach.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 297, $4.00 in paper copy, $2.25 in microfiche. Nevada Bureau of Mines and Geology, Report No 25, 1975. 38 p, 22 fig, 4 tab, 33 ref, 2 append. Published by Mackay School of Mines, Univ of Nevada, Reno. OWRT A-056-NEV (1) 14-31-0001-4028.

Descriptors: Thermal Springs, *Geothermal studies, *Thermal water, Trace elements, *Nevada, Evaluation, Groundwater, Wells, Beneficial use.
Identifiers: *Truckee Meadows(Nev).

This study describes occurrences of geothermal activity within Truckee Meadows area of Washoe County, Nevada, and discusses the potential for utilizing geothermal resources for residential heating. Probable effects of thermal waters on overall ground-water conditions under a pattern of increasing development within the basin are estimated. All chemical quality and temperature data for thermal and non-thermal ground waters were assembled and subjected to various forms of analysis. Results were used to precisely delineate areas of geothermal occurrence and assess the probable results of induced mixing of poor-quality thermal and good-quality non-thermal ground waters. Past and present utilization of the local geothermal resource were inventoried and evaluated. The most freqent present use is for single residence heating employing geothermal wells and simple heat-exchanger systems. Approximately 32 dwelling units and 3 commerical buildings are heated in this manner. This research indicates that space heating is the most practical beneficial use of the geothermal resources in the Truckee Meadows, and that further expansion of this use is

feasible under present technology. (Fallon-Nevada)
W76-01683

HEAVY METAL (CU, PB, ZN, CD, NI, AS, HG) ADDITIONS TO SURFACE WATERS, STREAMS SEDIMENTS AND SELECTED AQUATIC LIFE IN THE MERAMEC PARK RESERVOIR DRAINAGE BASIN, MISSOURI,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
P. D. Proctor, T. Butz, and B. Sinha.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 310, $4.50 in paper copy, $2.25 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, July 29, 1975. 44 p, 5 fig, 17 tab, 17 ref, 5 append. OWRT A-072-MO (1) 14-31-0001-4025 and 5025.

Descriptors: *Heavy metals, *Water quality, Surface waters, *Sediments, Aquatic life, Copper, Lead, Zinc, Cadmium, Nickel, Arsenic, Mercury, *Missouri, Reservoirs, *Path of pollutants, *Pollutant identification.
Identifiers: *Meramec River(Mo), *New Lead Belt(Mo), Meramec Park Reservoir Basin(Mo), Barite, Galena.

Heavy metal content of surface waters, stream and bank sediments, and selected aquatic life were determined for five distinct drainage areas in the 1475 square mile Upper Meramec River Basin. A planned reservoir will recieve water and sediments from fringe mining areas producing lead, copper, zinc, cadmium, and barite. Heavy metal content in surface waters is in low parts per billion and mainly meets US Public Health Service standards for drinking water. Cadmium locally approaches the upper limit of 10 ppb at six sample sites. Lead and cadmium content in waters are highest in drainage from the New Lead Belt fringe. Mercury is less than 0.1 ppb for all areas. Two sets of stream sediments from 55 and 69 sample sites, respectively, were analyzed for acid leachable heavy metal content. Leachable heavy metal content is several orders of magnitude greater than for water, except for mercury. The sediments from the fringe of the New Lead Belt have the highest average content of lead, copper, zinc, cadmium and nickel. Highest anomalous values occur in this same drainage area, followed by sediments from the fringe of a barite - galena mining area on the east of the basin. Selected aquatic life has heavy metal content and distribution patterns similar to the stream sediments. Effect of entrapment of acid leachable heavy metal content in stream sediments in a reservoir environment is unknown, as also the effect on associated plants and food-chain relationship to other organisms. Monitoring of the water-sediment environment is recommended when and if the reservoir is completed.
W76-01686

THE EFFECTS OF REGIONAL DEVELOPMENT ON THE ILLINOIS RIVER ENVIRONMENT,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
R. N. DeVries, and D. F. Kincannon.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 279, $6.75 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1975). 164 p, 37 fig, 25 tab, 56 ref, 3 append. OWRT A-058-OKLA (1) 14-31-0001-5036.

Descriptors: *Water quality, *Land use, *Waste assimilation capacity, Oklahoma, Arkansas, *Regional development, Low flow, Data collections, Model studies, Water pollution sources.
Identifiers: *Illinois River(Okla-Ark).

Little water-quality data exist for the scenic and popular Illinois River Basin in Oklahoma and Arkansas, making it impossible to predict the impact of regional developments on the basin. Preliminary studies were made to determine the water quality and quantity characteristics of the river and its tributaries, the assimilative capacity of the river, and the present land use pattern. A statistical analysis of the low flows at gaging stations on the Illinois River, Flint Creek and the Barron Fork was made. Allowable organic waste loadings were investigated and modeled. The National Weather Service River Forecast System's streamflow simulation model was fit to the existing basin data. This model will be used in future studies to determine the correlation between quality and quantity. All available water quality data were analyzed along with additional field quality data obtained in 1975 at selected locations. Land use information was obtained using ERTS. The present water quality of the basin is excellent. In order to maintain this quality, models must be developed to predict environmental changes that result from development within the basin.
W76-01690

FATE OF NITROGEN IN SEWAGE EFFLUENT APPLIED TO SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. C. Lance.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR 3, p 131-0144, September, 1975. 2 fig, 1 tab, 32 ref.

Descriptors: *Nitrogen, *Nutrient removal, *Sewage disposal, *Sewage effluents, *Water reuse, Nitrogen compounds, Fertilizers, Environmental sanitation, Sewage treatment, Waste water disposal, Sanitary engineering, Sewage, Filtration, Water conservation, Irrigation water, Water spreading, Irrigation, Infiltration.

Sewage water is generally applied to land in 3 types of application systems: low-rate or irrigation systems, high-rate land filtration, and overland flow or spray-runoff. Each of these systems will remove nitrogen from wastewater if the right soil is selected and the system is properly managed. If areas of crop land are located near the treatment plant, the sewage effluent nutrients can help pay for the treatment. Nitrogen can be removed with a much smaller land area by using a high-rate land filtration system and managing it to promote denitrification. Sewage water could also be applied at high infiltration rates, removing most of the organic matter and harmful microorganisms but not the nitrogen, and then be collected with drains or pumped from the groundwater for unrestricted irrigation use. The overland flow system can be used on soils with a very low permeability where no other land treatment could be used. It could also be used as the sole sewage treatment for some small communities. (Robinett-Arizona)
W76-01696

SOURCES OF POLLUTION FROM MILITARY INSTALLATIONS, PART II,
Rensselaer Polytechnic Inst., Troy, N.Y.
L. K. Wang, J. G. Michalovic, R. G. Ross, and V. J. Ciccone.
Water and Sewage Works, Vol 122, No 8, p 69-71, August, 1975. 12 tab, 21 ref.

Descriptors: *Waste water(Pollution), *Water pollution sources, *Pollutant identification, Oil, Detergents, Storm runoff, Phenols, Chemical oxygen demand, Biochemical oxygen demand, Mathematical estimating equations, Flow rates.
Identifiers: *Military installations, Combined wastes, *Air Force bases, Washrack waste water, Total organic carbon(TOC).

Various waste water streams generated from military bases were analyzed and identified. Washrack waste waters are divided into two separate groups: materials in dirt films, such as soil, grease and oil; and detergents, soaps and solvents. General characteristics of waste waters are very similar despite the wide variability in differences of operation from installation to installation. Characteristics of various combined waste streams were studied. The chemical composition of a specific combined waste stream can be mathematically estimated if the quantity and the percent flow of each participating stream are known. Flow meters can be used to measure the flows of each participating waste stream at different times of day so that the combined waste waters may be estimated. The feasibility of this is subject to further field investigations. (Pinto-FIRL)
W76-01763

WATER RENOVATION USING DEEP NATURAL SAND BEDS,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5D.
W76-01765

CONTAMINANTS IN RAINWATER AND THEIR RELATION TO WATER QUALITY, PART I,
Suffolk County Dept. of Environmental Control, N.Y.
J. A. Frizzola, and J. H. Baier.
Water and Sewage Works, Vol 122, No 8, p 72-75, August, 1975. 1 fig, 2 tab.

Descriptors: *Rainwater, *Groundwater, *Water quality, Evapotranspiration, Pollutants, New York, Precipitation(Atmospheric), Aanalytical techniques, Water pollution sources, Water pollution effects.
Identifiers: Long Island(NY).

The effect of rainwater quality on groundwater on Long Island is discussed. Long Island's sole water supply is groundwater, and the sole source of the groundwater is precipitation. Under natural conditions, about 50% of the precipitation is lost, mainly due to evapotranspiration, before it could become groundwater. The final quality of the groundwater is due not only to trace substances that may be picked up by rainwater in the atmosphere, but also by the hydrogeological processes that take place between the surface and the saturation point of the ground. Natural processes include: evapotranspiration, absorption, adsorption, and ion-exchange. Unnatural processes, termed pollution effects, include sources such as fertilizers, cesspools, leachate, and urban runoff. Precipitation study has experienced a resurgence lately, and the U.S. Geological Survey has developed a network of testing stations in New York State. The two stations discussed are Mineola and Upton in Long Island. To investigate the effects of lawn and garden fertilizers on groundwater the Suffolk County Department of Environmental Control set up a testing station at Medford, which is a flat area. Two types of samples are taken: a bulk monthly sample, and a sample of each precipitation event. Data analyses of samples were concerned with pH, nitrate, ammonia, sulfate, total nitrogen and chloride to sodium ion ratios, along with other ion tests. (Pinto-FIRL)
W76-01769

TRACE METALS IN MELBOURNE RIVERS-AN INTERLABORATORY ANALYSIS,
Materials Research Labs., Ascot Vale (Australia).
For primary bibliographic entry see Field 5A.
W76-01770

SIMULATION OF BOD AND DO BALANCE WITH RESPECT TO A POLLUTED SHALLOW RIVER (PART I): MATHEMATICAL MODEL,
S. Aiba, M. Okada, H. Otake, R. Sudo, and T. Mori.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol 12, No 131, p 33-38, April, 1975. 5 fig, 11 ref.

Descriptors: *Biochemical oxygen demand, *Rivers, *Pollutant identification, *Model studies, *Simulation analysis, *Dissolved oxygen, *Mathematical models, Algae, Flow characteristics.

A physical-mathematical model was derived for urban river systems, emphasizing the effects of algae on biochemical oxygen demand and dissolved oxygen. The model was particularly designed for shallow and narrow rivers such as those in Japan. Quantitative analyses of daily variation of dissolved oxygen by algae and of second stage BOD were performed. Second stage BOD was determined by the adsorption structure of algae, water velocity, water temperature, and the quantity of the adsorbed algae on the river bed. The overall rate of photosynthesis of algae and the respiration rate were determined by illumination and dissolved oxygen, respectively, and by constants which depend on the physiological conditions of the algae. The physical-mathematical models for BOD and DO balances were then derived by using the above parameters and the flow conditions of the river. (Su-FIRL)
W76-01777

REPRESENTATION OF MACROSCOPIC FLOW IN AN AERATION BASIN BY A CASCADE FORMED BY TWO UNEQUAL PERFECT MIXERS (REPRESENTATION DE L'ECOULEMENT MACROSCOPIC DANS UN BASSIN D'AERATION PAR UNE CASCADE DE DEUZ MELANGEURS PARFAITS INEGAUX),
Montpellier-2 Univ., (France). Laboratoire de Genie Chimique.
For primary bibliographic entry see Field 5D.
W76-01778

CLASSIFICATION OF MODELS TO TIDAL WATERS,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
J. B. Hinwood, and I. G. Wallis.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineerers, Vol 101, No HY10, p 1315-1331, October, 1975. 1 tab, 141 ref.

Descriptors: *Waste water disposal, *Mixing, *Mathematical models, *Estuaries, Classification, Path of pollutants, Water pollution sources.

The development and direction of a water quality program for estuaries and tidal inlets requires a model to predict the mixing and movement of wastes discharged into the water. The models available are discussed in terms of the representations and simplifications used, and the range of conditions under which each model is satisfactory. The models all assume the wastes are miscible neutrally buoyant. The three general approaches to modelling water and waste movement include physical hydraulic models, passive electrical analog, and mathematical models. A numerical solution of the partial differential equations that describe water movement and pollutant transport is usually the most productive model. Only numerical models are considered in this discussion. The classification scheme presented is based on the number of spatial dimensions, the reference frame used, and the degree to which the hydrodynamic processes are included in any model. The factors governing the choice of a model for a particular investigation include: the use to be made of the model as part of the total investigation; the resources available for the study; the nature of the wastes; and, the nature of the estuary and its boundaries. The answers to these questions permit the selection of the appropriate type of model. The classification table will then indicate the models available to meet the requirements of the physical situation. (Orr-FIRL)
W76-01780

THE SIGNIFICANCE OF HYDROGEN SULFIDE IN GROUNDWATER,
E. C. C. Li.
Water and Sewage Works, Vol 122, No 8, p 66-67, August, 1975. 3 tab, 8 ref.

Descriptors: *Anaerobic conditions, *Anaerobic bacteria, *Groundwater, *Analytical techniques, *Hydrogen sulfide, Sulfides, Sulfates, Groundwater resources, Leaching, Water pollution sources, Water quality, Landfills.

Hydrogen sulfide is found in groundwater mainly as a result of anaerobic sulfate reductions. An analysis was made of the concentrations of sulfide in groundwater. Three drilled wells in Oklahoma were sampled; these were located within a sanitary landfill, 0.7 miles upstream from the landfill site, and one mile downstream from the site. Water and mud were collected and analyzed for chemical parameters and for the presence of sulfate-reducing bacteria. It was found that landfill groundwater and downstream groundwater were in reducing states with an anaerobic environment; upstream groundwater was also in a reducing state and had a micro-aerophilic environment. A relatively high concentration of dissolved sulfate was found in the landfill groundwater, indicating that decomposed products containing large quantities of sulfate in the landfill were leaching into the groundwater. Analysis of bottom muds showed that sulfide sulfur was dominant, particularly in the landfill sample and was associated with dissimilatory sulfate reducing bacteria that exist only under strict anaerobic conditions. Since organic matter stagnated and accumulated in the landfill area, most sulfate reduction occurred near the mud surface, causing serious pollution at that location. (Kramer-FIRL)
W76-01781

SOME ENVIRONMENTAL PROBLEMS AND THEIR SATELLITE MONITORING,
Tel Aviv Univ., (Israel). Dept. of Environmental Sciences.
J. Otterman.
Journal of the British Interplanetary Society, Vol 28, No 9/10, September/October, 1975. 5 fig, 38 ref.

Descriptors: *Satellites(Artificial), *Monitoring, Surface waters, Water pollution sources, Oil spills, Land use, Water pollution control, Waste treatment.
Identifiers: Albedo.

Results from the first Earth Resources Technology Satellite in monitoring land and water surface changes are presented. Previous studies utilizing this type of satellite and its imagery have been performed in the fields of agriculture, forestry, hydrology, oceanography, limnology, and pollution studies. The possibilities of modifying the sensors of the ERTS (LANDSAT) series satellites for appropriate environmental monitoring are discussed. Some of the dangers linked to land use pressures and surface pollution, such as climatic modification and severe regional environmental impact, are surveyed. Two areas for which monitoring is necessary are: the determination of land use changes due to overgrazing and how such changes affect albedo and land surface-atmosphere interactions; and the determination of land and water surface pollution, particularly the detection of oil slicks. Satellite monitoring is proposed both for assessing the land use and pollution situations and for introducing and following remedial procedures. (Kramer-FIRL)
W76-01791

WATER QUALITY STUDIES AND LAND-USE MAPPING USING ERTS-1 DATA,
Lund Univ. (Sweden). Dept. of Geography.
For primary bibliographic entry see Field 5A.
W76-01792

THE ROLE OF PLANT RESIDUES IN THE RETENTION OF CADMIUM IN ECOSYSTEMS,
Delaware Univ., Newark. Dept. of Biological Sciences.
G. F. Somers.
Available from the National Technical Information Services, Springfield, Va 22161 as PB-247 556, $4.00 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 24 p, 2 fig, 6 tab, 5 ref. OWRT A-032-DEL(1).

Descriptors: *Cadmium, Forests, *Decomposing organic matter, *Adsorption, *Plant physiology, Water pollution, Ecosystems, *Degradation(Decomposition), Assay.

Both fresh and partially decomposed residues of plant material from an old field, a deciduous hardwood forest and from under pine trees exhibited a high affinity of Cd++. The samples were dried and the degree of adsorption of Cd++ was assayed using 109Cd. Using the theory of multiple equilibria (Klotz, 1953) the total number of Cd-binding sites (n) and the intrinsic association constant (K) were determined. These appeared to fall into two classes with lower values for n and higher ones for K at concentrations of <3x10-4 M Cd++ and the converse being true at higher concentrations of Cd++. Changes in the magnitude of n with litter decomposition appeared to be associated to some degree with changes in 'cellulose' and 'lignin' content. The total quantity of exchange sites corresponded to from 0.016 to 0.331 moles Cd/m2 depending upon source of litter and degree of decompition. It is suggested that such material could have a substantial role in smoothing out ambient surges in Cd++ pollution.
W76-01813

REMOTE SENSING OF COAL MINE POLLUTION IN THE UPPER POTOMAC RIVER BASIN.
Ambionics, Inc., Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161, as N74-34817, $4.50 in paper copy, $2.25 in microfiche. NASA Report CR-132529, 1974. 67 p, 7 fig, 6 ref. NASA NAS-1-12673.

Descriptors: *Remoting sensing, *Water pollution sources, *Coal mines, *Mine waste, Mine drainage, Mine acids, Mine water, Acid mine water, Strip mines, Strip mine wastes, Vegetation, Pollutant identification, Satellites(Artificial), Aerial photography, Surveys, *Potomac River.
Identifiers: *ERTS.

The purpose of the program was to investigate the utility of combining data sensed remotely from satellites and aircraft with those obtained by traditional field methods of surface sampling, in a more effective approach to monitoring water pollution caused by mining activities, both active and abandoned. The sparsely settled reaches of the upper Potomac River was selected as the test site. The area is almost devoid of industry except coal mining, lessening the confusing effects of other contributing pollution sources. Active teams of scientists live and work in the area who have provided data on the history, land use practices, all polluting agencies, and the effects of pollution. Sufficient work has been done to determine that while remote sensing in no way obviates the need for traditional grab sample monitoring, in can provide a method for correlating, refining, and making more efficient a total monitoring program. Limitations found included the high probability that the test site will be obscured by clouds or haze during an overflight. (Sims-ISWS)
W76-01831

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, APPENDIX II,
Ocean Systems, Inc., Reston, Va.
For primary bibliographic entry see Field 5G.
W76-01835

OIL/WATER TANK CONTENT PROFILES,
Exxon Research and Engineering Co., Florham Park, N.J.
For primary bibliographic entry see Field 5A.
W76-01837

FEASIBILITY OF REMOTE SENSING FOR DETECTING THERMAL POLLUTION--PART I: FEASIBILITY STUDY; PART II: IMPLEMENTATION PLAN,
Miami Univ. Coral Gables, Fa. Dept. of Mechanical and Industrial Engineering.
For primary bibliographic entry see Field 5A.
W76-01838

DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING THERMAL INFRARED IMAGERY,
Alabama Univ., Huntsville. Center for Environmental Studies.
F. L. Doyle.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-12546, $3.50 in paper copy, $2.25 in microfiche. Interim Report to National Aeronautics and Space Administration, October 31, 1974. 14 p, 4 fig, 5 ref, 1 append. NASA NAS8-30216.

Descriptors: *Remote sensing, *Fractures(Geologic), *Soil moisture, *Thermal radiation, Infrared radiation, Temperature, Limestones, Wastes, Water pollution, Regolith, Bedrock, Aquifers, Soil texture, Weathering, Vegetation, Instrumentation, Density, Fourier analysis, Topography, Thermal capacty.
Identifiers: Hybrid optical/digital data processor, Laser beam, Horizontal bar filter, Imagery, Enhancement.

Research is being conducted to find applications of remote-sensing techniques to groundwater hydrology. The effect of soil moisture on surface temperature and the relationship between soil moisture and groundwater is being investigated. Thermal differences at the earth's surface were recorded over the southwestern part of Madison County and adjacent Limestone and Morgan Counties, Alabama, by a Bendix LN 2 thermal scanner. Relative temperature differences between adjacent areas were evidenced by light and dark gray hues, cooler area being darker and warmer areas lighter. Entry of contaminants into the limestone aquifer is more likely to occur where solution has occured, such as along bedding planes or fractures. In north Alabama, however, the overburden is usually several tens of feet thick, and solution openings are hidden. A moisture differential will exist in the soil profile above a solution opening, as opposed to the profile above and area where no solution opening is present. Ground truth data in the form of soil temperature and moisture was used to corroborate the information of the thermography. Recommended conditions for use of thermal imagery to detect maximum thermal contrast due to soil moisture were outlined. (Visocky-ISWS)
W76-01840

THE DISTRIBUTION OF EXCESS TEMPERATURE FROM THE VIENNA GENERATING STATION ON THE NANTICOKE RIVER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
H. H. Carter, and R. J. Regier.
Technical Report 90, Reference 75-5, June 1975. 60 p, 49 fig, 2 tab, 13 ref. ERDA AT(11-1)-3062.

Descriptors: *Thermal pollution, *Powerplants, *Cooling water, *Tidal streams, *Maryland, Temperature, Tides, Estuaries, Measurement, Analysis, Distribution, Path of pollutants, Velocity, Tracers, Diurnal distribution, On-site investigations, Water temperature, Heated water, Discharge(Water), Dye release.
Identifiers: *Nanticoke River(Md).

Temperature and dye tracer data, collected in the Nanticoke River in the vicinity of the Vienna Generating Station during April 1974, were analyzed and interpreted in terms of the distribution of excess temperature as a function of tidal phase. The extent and location of the thermal plume were determined. The analysis showed that over most of the estuary larger lateral temperature gradients resulted from differential solar heating than from the heated water discharge. Considerable recirculation was observed. The maximum recirculation of 24% was observed near the middle of the ebb cycle. Total cooling water flow was estimated from intake and discharge dye concentrations and was found to be about 87% of the rated pump capacity. (Adams-ISWS)
W76-01843

TURBULENT JETS WITH REVERSIBLE BUOYANCY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
S. C. Jain, and J. M. Pena.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY9, Paper 11586, p 1221-1233, September 1975. 6 fig, 16 ref. 3 append.

Descriptors: *Jets, *Heated water, *Turbulent flow, *Thermal pollution, *Lakes, Hydraulics, Analytical techniques, Freezing, Nozzles, Buoyancy, Heat transfer, Mixing, Water temperature, Discharge(Water), Density.
Identifiers: *Submerged jets, Momentum flux, Density deficiency profiles.

Large quantities of waste heat from electric power plants are discharged into natural bodies of water such as lakes, rivers, and oceans. The solutions derived from this study can be used to predict the behavior of warm submerged jets discharging into lakes during winter season when the ambient temperature of the lake is near the freezing mark. Due to the peculiar variation of the density of water at low temperatures, the behavior of a warm water jet is different from that of a buoyant jet in which the density can be assumed to be a linear function of the temperature. The problem was analyzed by employing the integral approach and assuming similarity conditions for velocity and temperature profiles. The nonlinear variation of density with temperature was included in the analysis. Results for the jet trajectory, width, and dilution were presented in graphical form. The jet trajectory was deflected downward for all the initial conditions examined. For the initial jet angles greater than zero, the jet rises to a maximum height due to initial vertical momentum and then starts sinking. The maximum rise of the jet is linearly proportional to the jet Froude number. (Singh-ISWS)
W76-01849

SOME EFFECTS OF CADMIUM ON CONIFEROUS FOREST SOIL/LITTER MICROCOSMS,
National Ecological Research Lab., Corvallis, Oreg.
H. Bond, R. Lighthart, R. Shimabuku, and L. Russell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 035, $4.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-036, June 1975. 30 p, 9 fig, 1 tab, 30 ref. 1AA006.

Descriptors: *Cadmium, *Coniferous forests, *Forest soils, *Litter, Oxygen, Carbon dioxide, Degradation(Decomposition).

Description and criticism are given of a preliminary design and use of a soil/litter microcosm in which oxygen, temperature and humidity are kept constant and oxygen generation and carbon dioxide and heat evolution rates are monitored. Experiments were performed using four microcosms, one acting as a dead control. For 'identically' prepared and incubated microcosms, the coefficient of variation was as small as 3.8 percent for carbon dioxide evolution rate and as large as 9.9 percent for oxygen consumption rates. An adjustment period of seven to ten days after microcosm preparation was necessary to approach relatively constant production rates. For microcosms adjusted to 10, 30, and 60 percent of field water holding capacity, oxygen and carbon dioxide rates and bacterial densities vary directly whereas the fungi and actinomycetes varied inversely. For 0.01 ppm, cadmium amended microcosms and initial stages in the 10 ppm CdCl2 unit, oxygen consumption was stimulated suggesting respiratory enzyme uncoupling while in the later stages the 10 ppm cadmium amended soils reduced both O2 and CO2 respiration by 40 percent. No organismal density changes due to cadmium were detected; longer experiments might be necessary to detect population density changes. (EPA)
W76-01862

THE EFFECT OF MIREX AND CARBOFURAN ON ESTUARINE MICROORGANISMS,
Mississippi State Univ., Mississippi State. Dept. of Microbiology.
L. R. Brown, E. G. Alley, and D. W. Cook.
Environmental Protection Agency, Report EPA-660/3-75-024, June, 1975. 47 p, 2 fig, 48 tab, 16 ref. 1 EA077. 68-03-0288.

Descriptors: *Estuarine environment, Adsorption, Microorganisms, Hydrolysis, Toxicity, *Path of pollutants, Water pollution effects.
Identifiers: Chemical studies, Microcosm, Adsorption fate, *Mirex, *Carbofuran.

The purpose was to help establish the chemical, physical and micro-biological fate of mirex and carbofuran in the estuarine environment and determine the effect(s) on important estuarine microorganisms and their activities. Chemical studies on the adsorption, fate and hydrolysis were conducted. The microbiological studies involved the use of both pure cultures and mixed cultures in a microcosm system and included twelve distinct physiological groups of microorganisms. It was concluded that neither mirex nor carbofuran would have a deleterious effect on estuarine bacteria under normal conditions, and there was no evidence of bioaccumulation. Degradation products of both compounds were shown to be toxic to some microorganisms. (EPA)
W76-01864

A STUDY OF LAGOONAL AND ESTUARINE PROCESSES IN THE AREA OF MERRITT ISLAND ENCOMPASSING THE SPACE CENTER--ANNUAL REPORT, 1 JUL. 1973--31 AUG. 1974.
Florida Inst. of Tech., Melbourne.
For primary bibliographic entry see Field 2L.
W76-01893

APPENDICES TO: SURVEY STUDY TO SELECT A LIMITED NUMBER OF HAZARDOUS MATERIALS TO DEFINE AMELIORATION REQUIREMENTS,
Little (Arthur D.) Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-01902

COMPARATIVE DISCHARGES OF FRESH AND WASTE WATER ALONG THE CALIFORNIA COAST,
California Univ., Santa Cruz. Earth Sciences Board.
G. B. Griggs, and P. A. McCrory.
Environmental Geology, Vol 1, No 2, p 89-95, 1975. 3 fig, 7 ref.

Descriptors: *Coasts, *Water quality, *Waste water(Pollution), Effluents, Heated water, Sewage, Streamflow, Environmental effects, California, *Thermal pollution.

Identifiers: *Coastal waters, *California coast.

About 0.75 x 10 to the sixth cubic meters of industrial waste water, 3.75 x 10 to the sixth cubic meters of domestic waste water, and 26.5 x 10 to the sixth cubic meters of thermal effluents were found to be discharged daily into California's nearshore waters. Waste water discharged near shore remained there for considerable time and had significant effects on water quality and marine life. A large excess of waste water over fresh water discharge was observed. Many individual wastewater discharges exceeded the average daily discharge of most of the rivers which entered the coastal waters. (Klein)
W76-01914

TRANSLOCATION OF HYDROCARBONS IN AQUATIC FOOD CHAINS,
California Univ., Davis. Dept. of Animal Physiology.
For primary bibliographic entry see Field 5C.
W76-01921

MARINE MEIOFAUNA OF A NEW YORK CITY BEACH WITH PARTICULAR REFERENCE TO TARDIGRADA,
City Coll., New York. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-01930

EFFECT ON DETERGENTS AND OF PHOSPHO-GYPSUM ON THE OXYGEN AND CHLOROPHYLL A LEVELS AND ON THE DRY WEIGHT OF THE RESIDUE OF BRACKISH WATER UNDER LABORATORY CONDITIONS,
Medical Academy, Gdansk (Poland). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-01942

ON THE INFLUENCE OF SEWAGE POLLUTION ON INSHORE BENTHIC COMMUNITIES IN THE SOUTH OF KIEL BAY. PART I. QUALITATIVE STUDIES ON INDICATOR SPECIES AND COMMUNITIES,
Kiel Univ., (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 5C.
W76-01944

BENTHIC MEIOFAUNA AS INDICATOR OF OXYGEN CONDITIONS IN THE NORTHERN BALTIC PROPER,
Stockholm Univ. (Sweden). Asko Lab.; and Stockholm Univ. (Sweden). Dept. of Zoology.
R. Elmgren.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 265-271, 1975. 2 fig, 2 tab, 21 ref.

Descriptors: *Biomass, *Bioindicators, *Benthic fauna, *Sampling, Oxygen, Bivalves, Copepodes, Speciation, Population, Nematodes, Water pollution sources.
Identifiers: *Meiofauna, Water Zonation, *Baltic Sea.

The benthic meiofauna below 45 meters gave a clear and consistent zonation. In the upper zone of continuously higher oxygen content, a diverse and abundant meiofauna of high biomass occurred. In the intermediate zone, the oxygen values fluctuated greatly, owing to the oscillations of the primary halocline. As the mean oxygen content decreased gradually with depth, several taxa dissappeared successively from the meiofauna and intermediate to low biomass resulted. In the lower zone, the meiofauna was extremely impoverished, consisting of very low numbers of nematodes. The use of meiofauna as bioindicators was discussed and supported. (Klein)
W76-01945

REMARKS ON INDICATOR ORGANISMS (MEIOFAUNA) IN THE COASTAL WATERS OF THE GDR,
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
G. Arlt.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 272-279, 1975. 3 fig, 11 fig.

Descriptors: *Bioindicators, *Sediments, *Sampling, Sewage water, Water quality, Benthos, Biomass, Water pollution sources, Speciation.
Identifiers: *Coastal waters, *Meiofauna, Paranais litoralis, Nitocra spinipes, Amphichaeta sannio, Tachidius discipes, *Baltic Sea.

The influence of sewage on the qualitative and quantitative composition of the meiofauna was investigated on the basis of a number of unscreened live sediment samples taken from three stations in the eulittoral of the Greifswalder Bodden. Although all three localities were largely similar with respect to sediment quality, vegetation, degree of exposure, depth of water and salinity, there were noticeably differences between the sampling areas polluted by sewage and those which were free of pollution. An increase in the abundance of Paranais litoralis and Nitocra spinipes and a decrease in the numbers of Amphichaeta sannio and Tachidius discipes were noticed as the pollution increased. The practical value of indicator organisms for the classification of the waters in shallow inlets and their degree of pollution was briefly discussed with reference to the effort required to measure physical and chemical parameters. (Klein)
W76-01946

EFFECTS OF A SULPHATE PULP MILL ON THE BENTHIC MACROFAUNA IN A FIRTH OF THE BOTHNIAN SEA,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5C.
W76-01947

ALGAL ZONATION ON ROCKY SHORES OUTSIDE HELSINKI AS A BASIS FOR POLLUTION MONITORING,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
For primary bibliographic entry see Field 5C.
W76-01951

5C. Effects Of Pollution

STUDIES ON THE TOLERANCE OF YOUNG OF THE YEAR MISSISSIPPI RIVER FISH TO HEATED WATERS,
Wisconsin Univ.--Eau Claire. Dept. of Botany.
V. A. Cvancara.
Available from the National Technical Information Service, Springfield, Va 22161, as PB247-094, $3.50 in paper copy, $2.25 in microfiche. Completion Report, (1975). 21 p, 10 fig, 3 tab, 43 ref. OWRT C-4251 (No 9037) (1).

Descriptors: Freshwater fish, Aquatic animals, Aquatic life, *Juvenile fish, *Thermal pollution, Temperature, *Thermal stress, Bass, Bullheads, Carpsuckers, Drums, Pikes, White bass, Shad, Sunfish, Heated water, Water pollution effects, *Mississippi River, *Water temperature, *Minnesota.

An attempt was made to simulate in the laboratory, Mississippi River water conditions in a one way flow experimental chamber to determine the temperature tolerance of young-of-the-year fish. This parameter was chosen to simulate the environmental conditions that young fish would face in their natural hatching areas when confronted with an actual thermal plume as from the effluent of a large nuclear electricity generating plant. Young-of-the-year of eight Mississippi River species were obtained in sufficient numbers from the study area located near Winona, Minnesota. The temperature at which 50% of the experimental young-of-the-year fish survived the 48 hour test period were as follows: Gizzard shad (Dorosoma cepedianium) 28.5C; Bluegill (Lepomis macrochirus) 28.5C; Northern pike (Esox lucius) 30.8C; Freshwater drum (Aplodinotus grunniens) 32.8C; White Bass (Morone chrysops) 33.5C; Largemouth bass (Micropterus salmoids) 35.6C; Black bullhead (Ictalurus melas) 35.7C. The range of Mississippi River water temperature during July and August of 1973 was 23 to 31 C while the range during July and August 1974 was 22 to 33C. It appears that these young fish during short periods of peak summer temperatures would suffer some heat stress normally and the problem would be compounded if heated effluents were added to the river during periods of high summer temperature.
W76-01520

CHLORINATED SEWAGE EFFLUENTS AND AVOIDANCE REACTION OF STREAM FISH,
Maryland Univ., College Park. Inland Environmental Lab.
C. F. Tsai, and J. A. Fava, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 102, $4.50 in paper copy, $2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No 35, (July 1975). 59 p, 5 fig, 12 tab, 31 ref. OWRT A-022-MD(2) 14-31-0001-5020.

Descriptors: Sewage effluents, *Chlorine, *Ammonia, Toxicity, Water pollution effects, Lethal limit, *Fish behavior.
Identifiers: *Blacknose dace, *Chloramines, Avoidance index, Activity index, Threshold avoidance concentration, Median avoidance concentration, Latent period, Median avoidance time, Free chlorine.

The behavioral responsed of the blacknose dace to domestic sewage effluents and their toxic constituents, free chlorine, chloramine, and ammonia were investigated. The degrees of the fish avoidance to chlorinated sewage effluents were identical with those to the chloramine solutions and much higher than those to free chlorine solutions. The threshold avoidance concentration for chloramine solutions and chlorinated sewage effluents was 0.17 mg/l and 0.12 mg/l as total chlorine respectively, much lower than 0.58 mg/l for the free chlorine solutions. In a delayed response study, the fish could avoid both chloramine solution and free chlorine solutions as low as 0.07 mg/l. There was initial preference reactions to free chloride solutions, which shifted to avoidance reaction later. The latent period and the median avoidance time were shorter for chloramine solutions than for free chlorine solutions. The results indicate that chloramines are the major constituents of chlorinated sewage effluents, causin the absence or depletion of fish below sewage outfalls by the avoidance behavior of the fish.
W76-01523

TOXICITY OF ROTENONE TO SOME SPECIES OF COARSE FISH AND INVERTEBRATES,
Ministry of Agriculture, Nairobi (Kenya). Water Dept.
B. S. Meadows.
J Fish Biol. Vol 5, No 2, p 155-163, 1973. Illus.

Descriptors: *Rotenone, *Pesticide toxicity, Pesticide residues, Fish management.
Identifiers: Rutilus rutilus, Roaches.

The toxicity of rotenone was determined for 7 spp. of fish and 3 spp. of invertebrates. The results show that there is a marked variation in sensitivity of different species to rotenone. The survival

times of roach Rutilus rutilus (L.) were reduced by a rise in temperature and also by a reduction in water hardness. Temperature affected the rate at which rotenone is degraded; 3 days after being prepared a solution containing 2 mg/l of 5% rotenone was non-toxic to roach over a 7-day period at 20 degrees C, but it was still toxic for at least 11 days at 11.5C. The data are discussed in relation to the use of rotenone in fisheries management.--Copyright Biological Abstracts, Inc.
W76-01534

THE DYNAMICS OF NUTRIENT LIMITATION OF PHYTOPLANKTON ALGAE: A MODEL RECONSIDERED,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
For primary bibliographic entry see Field 2H.
W76-01540

AN INTRODUCTION TO THE PROCESSES, PROBLEMS, AND MANAGEMENT OF URBAN LAKES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2H.
W76-01588

THE MIGRATION OF FLY LARVAE (SIMULIIDAE) IN WATER WITH HIGH LEVELS OF TURBIDITY(IN RUSSIAN).
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 2I.
W76-01615

SOURCES AND DISTRIBUTION OF TRACE METALS IN AQUATIC ENVIRONMENTS,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5B.
W76-01651

SUMMERKILL RISK IN PRAIRIE PONDS AND POSSIBILITIES OF ITS PREDICTION,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1283-1288, 1975, 3 fig, 2 tab, 15 ref.

Descriptors: *Forecasting, *Fishkill, *Potholes, *Risks, Algae, Fish farming, Summer, Chlorophyll, Dissolved oxygen, Light penetration, Secchi disks, Ammonia, Nitrogen, Specific conductivity, Winter, Correlation analysis, Canada.
Identifiers: *Erickson-Elphinstone Area(Manitoba), Aphanizomenon flos-aquae, Microcystis.

Fifty-one pothole lakes in the Erickson-Elphinstone area of Manitoba were studied to obtain criteria for assessing and predicting summerkill risk. Collapses of heavy algal blooms, mostly Aphanizomenon flos-aquae, and subsequent oxygen depletion caused summer fish kills in these ponds. Kills only occurred in ponds where the specific conductance range was 800-2000 micromhos/cm and chlorophyll-a concentration above 100 micrograms/l. Prairie ponds with summer chlorophyll-a maxima of 25-100 micrograms/l developed only moderate blooms of Anabaena, Microcystis, or diatoms in the spring and never exhibited summerkill. Ponds with chlorophyll-a maxima below 25 micrograms/l were usually clear but frequently developed dense bottom vegetation. A practical system for assessing summerkill risk substituted Secchi disk transparency measurements for chlorophyll-a values. Correlations between various parameters indicated that the best correlation was between late winter ammonia nitrogen concentration and maximum chlorophyll-a concentration the following summer. Two summerkill prediction systems are proposed, based on ammonia, dissolved oxygen, and Secchi disk transparencies, enabling prediction of summerkill risk 3 or 9 months prior to fish stocking. The nine month system was more reliabe but more difficult because frequent sampling was necessary. Macrophyte chlorophyll-a concentrations and salinity effects on fish yields should also be considered. (Buchanan-Davidson--Wisconsin)
W76-01653

THE ROLE OF AMINO ACIDS IN THE NITROGEN CYCLE OF LAKE MENDOTA,
Wisconsin Univ., Madison. Water Chemistry Lab.
W. S. Gardner, and G. F. Lee.
Limnology and Oceanography, Vol 20, No 3, p 379-388, 1975, 5 fig, 3 tab, 24 ref. EPA 5 5-T02-WP-00184, EPA 16010.

Descriptors: *Amino acids, *Nitrogen cycle, *Eutrophication, *Wisconsin, Trace elements, Bacteria, Algae, Hypolimnion, Epilimnion.
Identifiers: *Dissolved free amino acids, *Lake Mendota(Wis), Aphanizomenon, Serine, Alanine.

To understand the importance of amino acids in the nitrogen cycle the concentration of dissolved free amino acids was determined in this eutrophic Wisconsin lake. Less than 0.01 micromoles dissolved free amino acids were present; they appeared to be controlled by bacterial uptake. Larger concentrations of combined amino acids were found. Of ten amino acids studied (alanine, valine, isoleucine, threonine, leucine, serine, proline, phenylalanine, tyrosine, and lysine, but not glycine), serine and alanine were most prevalent in the dissolved fraction. Free and combined amino acids showed little variation with season and depth, but the levels of particulate amino acids increased in the epilimnion during the warmer months, when conditions were favorable for algal growth. In the hypolimnion concentrations of amino acids in particulate material were lower than in the dissolved fraction. Daily examination of shore samples suggested that concentrations of dissolved free amino acids generally remained at trace levels, but higher concentrations were observed during a period of rapid algal decomposition after an Aphanizomenon bloom. Shore water samples taken daily 3 m below the lake surface contained lower and more uniform dissolved free amino acid concentrations than samples of surface water. (Buchanan-Davidson--Wisconsin)
W76-01654

COLLAPSES OF ALGAL BLOOMS IN PRAIRIE POTHOLE LAKES: THEIR MECHANISM AND ECOLOGICAL IMPACT,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 606-615, 1975, 11 fig, 1 tab, 19 ref.

Descriptors: *Eutrophication, *Algae, *Potholes, *Mode of action, Lakes, Fish farming, Cyanophyta, Chlorophyta, Canada, Summer, Diatoms, Spring, Oxygen sag, Phosphates, Ammonia, Nitrogen, Phosphorus, Toxins, Shallow water, Fishkill.
Identifiers: *Algal bloom mortality, *Erickson(Manitoba).

The consequences of algal bloom collapses were studied in prairie pothole lakes near Erickson, Manitoba, and especially their effect on fish farming. Massive algal die-offs in the eutrophic lakes consisted of collapses of Aphanizomenon flos-aquae blooms in July-early September of spring collapses of diatom blooms combined with small greens and non-Aphanizomenon blue-greens. Algal biomass reached its exponential phase rapidly with maximum chlorophyll-a and dissolved oxygen, and low Secchi transparency, ammonia, and soluble reactive phosphate, (SRP). Suddenly the algal mass sand, water cleared, dissolved oxygen dropped, and ammonia-nitrogen and SRP increased. After several partial collapses, a total crash occurred and anoxic conditions developed. Non-Aphanizomenon collapses released nitrogen, phosphorus, and ammonia-nitrogen. Ammonia and phosphate were released from lake sediments under anoxic conditions. The cause of algal collapses is not known. Ammonia-nitrogen in summer was inversely proportional to algal biomass; its release following algal collapse was accompanied by reactive phosphate release. Dissolved oxygen, a function of algal biomass, was directly proportional to chlorophyll-a. Primary production in an Aphanizomenon bloom was high. With even partial bloom collapse and dissolved oxygen depletion, respiration processes dominated the water column. After massive collapses, bacterial decomposition under anaerobic conditions can interfere with the entire ecosystem. (Buchanan-Davidson--Wisconsin)
W76-01655

NITROGEN, PHOSPHORUS AND CARBON CYCLES IN A DISTURBED EUTROPHIC ECOSYSTEM,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
FWI Reprint No. 373, 20 p, 8 fig, 1 tab, 8 ref. Paper presented at Second International Symposium on Environmental Biogeochemistry, April 8-11, 1975, Canada Centre for Inland Waters, Burlington, Ontario.

Descriptors: *Nitrogen cycle, *Phosphorus, *Carbon cycle, *Cycling nutrients, Carbon, Eutrophication, Algae, Biomass, Chlorophyll, Potholes, Oxygen sag, Diatoms, Ammonia, Phosphates, Dissolved oxygen, Nitrogen compounds, Organic compounds, Cyanophyta, Fish farming, *Canada.
Identifiers: *Erickson(Manitoba), Aphanizomenon flos-aquae, Microcystis, Merismopedia.

Seasonal cycles of nitrogen, phosphorus, and carbon were compared with those of dissolved oxygen and algal biomass (chlorophyll-a) in a eutrophic, prairie-pothole lake in the Erickson area of Manitoba. The lake became anoxic in midwinter due to ice and snow cover. Oxygen depletion of a shorter duration occurred following collapse of heavy summer blooms of Aphanizomenon flos-aquae or Microcystis, Merismopedia, and diatoms. Anoxic conditions caused rapid release of ammonia and reactive phosphate. Ammonia and reactive phosphate were inversely proportional to dissolved oxygen. Dissolved organic nitrogen, phosphorus, and carbon and inorganic carbon varied seasonally due to winter anaerobiosis. Particulate sestonic and dissolved organic nitrogen and phosphorus were major ammonia and reactive phosphate sources. Chlorophyll-a correlated with particulate carbon, nitrogen, and phosphorus. Lake nutrient cycles formed an internal system. Nutrients came from soil enriched with fertilizers and cattle farming, and were regenerated by winter decomposition of plankton and vegetation, creating conditions for blue-green algal blooms the next summer. These blooms governed the lake's oxygen regime. Bacterial oxygen depletion and accumulated algal material caused nutrient cycle disturbances. The nutrient regime determined the algal population; algal decomposition affected the nutrient regime. These phenomena affected water quality and lake suitability for fish survival. (Buchanan-Davidson--Wisconsin)
W76-01656

PERSISTENCE OF ENDOTHALL IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-01658

THE EFFECTS OF REGIONAL DEVELOPMENT ON THE ILLINOIS RIVER ENVIRONMENT,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-01690

POSSIBLE IMPACTS OF OIL SHALE DEVELOPMENT ON LAND RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Economics.
G. D. Weaver.
Journal of Soil and Water Conservation, Vol 29, No 2, p 73-76, March-April, 1974. 2 fig, 2 tab, 14 ref.

Descriptors: *Oil shales, *Water resources, *Land resources, *Groundwater resources, *Water quality, *Water requirements, Fossil fuels, Oil wastes, Oil pollution, Natural resources, Surface waters, Water conservation, Water management(Applied), Water pollution, Colorado River, Water supply, Water utilization, Arid lands, Colorado River Basin, Environmental effects, Overdraft, Groundwater mining, Water wells, Salinity, Leaching.
Identifiers: *Oil shale development, Upper Colorado River Basin, Shale waste.

The shale lands of principal interest lie within the sparsely settled, more arid portions of the Upper Colorado River Basin which provide forage for livestock, wildlife habitat, natural areas for recreation, and ground cover for the protection of watershed resources. Unacceptable environmental impacts that may result from the land distrubances caused by mining the oil shale, disposal of the retorted spent shale waste, or in situ retorting and well recovery of the shale oil are examined. Groundwater systems would be especially sensitive to overdraft or disruption of intake areas because of the low rates of natural recharge (intensive well pumpage in the northern Piceance Creek Basin, which contains 2 of the proposed lease tracts, would cause water levels to decline several hundred feet in less than one year). Emplacement of spent shale in the surface environment could result in leaching, vadose percolation, circulating groundwaters, or slurry drainage which would remove large amounts of sodium, calcium, magnesium, and sulfate ions. Salinity levels in streams could increase and an increase in the salinity pollution in the Colorado main stem would be felt by water users in the lower basin states and Mexico. (Robinett-Arizona)
W76-01691

ENTERIC VIRUS BEHAVIOR IN SAND DUNES,
Technion Israel Inst. of Tech., Haifa. Environmental Engineering Lab.
For primary bibliographic entry see Field 5D.
W76-01755

THE EFFECT OF OZONE ON THE DISSOLVED ORGANIC SUBSTANCES IN THE WATER OF LAKE CONSTANCE (WIRKUNG VON OZON AUF DIE GELOESTEN ORGANISCHEN SUBSTANZEN IM BODENSEEWASSER),
D. Maier.
Vom Wasser, Vol 43, p 127-160, 1974. 10 fig, 6 tab, 68 ref.

Descriptors: *Organic matter, *Ozone, *Water treatment, *Waste water treatment, Flocculation, Pollutant identification, Lakes.
Identifiers: Constance Lake.

A determination of the characterization of organic substances in the water of Constance Lake before and after ozone treatment was presented. The effects of ozone were measured by summarized parameters of total organic carbon, chemical oxygen demand and ultraviolet spectra. Total acid determination was also made for the ozonized water of the lake. Further detail was given by IR-spectroscopic investigations. The influence of ozone treatment on successive steps of treatment was further studied in terms of adsorption with activated carbon, flocculation, chlorine demand, and the growth of bacteria. (Kramer-FIRL)
W76-01760

SURVIVAL OF ENTEROBIRUSES ON VEGETABLES IRRIGATED WITH CHLORINATED OXIDATION POND EFFLUENTS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Food Engineering; and Technion Israel Inst. of Tech., Haifa. Dept. of Biotechnology.
H. Kott, and L. Fishelson.
Israel Journal of Technology, Vol 12, No 5/6, p 290-297, 1974. 5 fig, 3 tab, 19 ref.

Descriptors: *Chlorination, Solar radiation, *Viruses, *Irrigation, *Effluents, Waste water(Pollution), Pollutant identification, Oxidation lagoons, Ponds, Water pollution effects.
Identifiers: *Oxidation pond effluents, Phosphate buffered saline, Poliovirus 1 LSC.

Laboratory experiments were conducted on the irrigation of tomatoes and parsley by oxidation pond effluents. In the laboratory, tomatoes and parsley were dipped in chlorinated and non-chlorinated oxidation pond effluents (OPE) and in Phosphate Buffered Saline (PBS) containing attenuated poliovirus 1 LSC. The samples were then exposed to changing climactic conditions and virus counts were taken at set intervals. Solar radiation had a significant effect on the viruses. A minimum of 0.35 cal/sq cm min was needed to effect the rate of inactivation of the virus on the vegetable surface. Exposure to sunlight and to chlorination has a large effect on the amount of virus found on the vegetables, and the combined effect was even greater. Vegetables contaminated by virus in PBS solution were also affected greatly by solar radiation. Samples kept in the dark as a test still showed virus present after 6 days, whereas no active virus were found on the vegetables after being outside and exposed to two radiation peaks in 28 h. (Pinto-FIRL)
W76-01767

CONTAMINANTS IN RAINWATER AND THEIR RELATION TO WATER QUALITY, PART I,
Suffolk County Dept. of Environmental Control, N.Y.
For primary bibliographic entry see Field 5B.
W76-01769

PARTICIPATION OF MICROORGANISMS IN SULFUR TURNOVER IN POMIARETZKOE LAKE, (IN RUSSIAN),
Akademiya Nauk SSSS, Moscow. Institut Mikrobiologii.
V. M. Gorlenko, E. N. Chebotarev, and V. I. Kachalkin.
Mikrobiologiya. 43(5): 908-914. Illus. 1974.

Descriptors: *Lakes, *Microorganisms, *Sulfur bacteria, Sulfur, Meromixis, *Turnovers, Plankton, Entrophication.
Identifiers: Chlorobium-Vibrioforme, *Pomiaretzkoe Lakes, Thionic bacteria, USSR, Phototrophic bacteria.

The role of microorganisms in production and oxidation of S was studied in the meromictic lake Pomiaretzkoe (USSR) occupying the place of a former ozokerite mine. Water in the surface layers of the lake is fresh, while deep water contains up to 10 g/l of chlorides, 4.1 g/l of C02 and 340 mg/l of H2S. The highest rate of H2S production (30 mg/l/day) was registered in the upper layer of ozone deposits. The rate of H2S reduction in water was lower, but still almost 10 times higher than in water of other lakes of similar type. A high rate of sulfate reduction was due to a sufficient content in water and in oozes of sulfates, organic substances, phyto- and bacterioplankton, and organic substances of ozokerite origin. H2S in the lake was oxidized by the phototrophic sulfur bacterium Chlorobium vibrioforme, the plankton variant, and to a lesser extent, the thionic bacteria. A layer of green water, containing up to 46.106 cells of C. vibrioforme in 1 ml of water, was found at the depth of 3.0-3.5m. The maximal production of the phototrophic bacteria in this zone was 90 micro C/l/day.--Copyright 1975, Biological Abstracts, Inc.
W76-01774

ORGANICS, WATER, AND HEALTH: A REUSE PROBLEM,
California State Dept. of Health, Los Angeles. Water Sanitation Section.
For primary bibliographic entry see Field 5D.
W76-01789

THE ROLE OF PLANT RESIDUES IN THE RETENTION OF CADMIUM IN ECOSYSTEMS,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W76-01813

SOME EFFECTS OF CADMIUM ON CONIFEROUS FOREST SOIL/LITTER MICROCOSMS,
National Ecological Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B.
W76-01862

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON MANGANESE.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-01863

THE EFFECT OF MIREX AND CARBOFURAN ON ESTUARINE MICROORGANISMS,
Mississippi State Univ., Mississippi State. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-01864

ANALYSIS OF HYDROCARBONS IN MARINE ORGANISMS: RESULTS OF IDOE INTERCALIBRATION EXERCISES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-01901

SOME FACTORS INFLUENCING BYSSUS THREAD PRODUCTION IN MYTILUS EDULIS (MOLLUSCA: BIVALVES) LINNAEUS, 1758,
University of Southern California, Los Angeles. Allan Hancock Foundation.
T. Martella.
Water, Air and Soil Pollution, Vol 3, p 171-177, 1974. 2 fig, 1 tab, 7 ref.

Descriptors: *Biorhythms, *Mussels, *Animal physiology, Populations, Productivity, Growth rates, Tidal effects.
Identifiers: *Byssal thread production, Mytilus edulis, Circadian rhythms, Proximity.

Byssus thread production factors in Mytilus edulis considered were proximity to other M. edulis, circadian rhythms, and tidal rhythms. Production was greater at night than during the day, and greater for mussels clumped together. Tidal fluctuations had no influence on byssal thread production. The use of the average number of byssus threads produced/animal/hour as a measure of sublethal effects of pollutants may be subject to error. (Klein)
W76-01903

EFFECTS OF LEAD AND HYDROCARBONS FROM SNOWMOBILE EXHAUST ON BROOK TROUT (SALVELINUS FONTINALIS),
New Hampshire Univ., Durham. Dept. of Zoology.
E. S. Adams.
Transactions of the American Fisheries Society, No 2, 1975. 7 fig, 5 tab, 39 ref.

Descriptors: *Salmonids, *Brook trout, *Oil, *Organic compounds, *Lead, Ponds, Snowmelt, Path of pollutants, Water pollution effects, Environmental effects, Water quality.
Identifiers: Snowmobiles, *Snowmobile exhaust, Fingerlings, Tissue analysis, Bioaccumulation.

Lead content of the water in a Maine pond rose from 4.1ppb before snowmobiling to 135 ppb at ice-out; exposed brook trout (Salvelinus fontinalis) fingerlings contained 9 to 16 times more lead than controls. Hydrocarbon levels undetectable prior to snowmobiling reached 10ppm in the water and 1 ppm in exposed fish. Trout held in aquaria for 3 weeks in melted snow containing three different concentrations of snowmobile exhaust also showed lead and hydrocarbon uptake. Their digestive tract tissue contained the most lead (2ppm) and gills the least (0.2ppm). Stamina, as measured by the ability to swim against current, was significantly less in trout exposed to snowmobile exhaust than in control fish. (Klein)
W76-01904

CHRONIC EFFECTS OF COPPER ON SURVIVAL, GROWTH, AND REPRODUCTION OF THE BLUEGILL (LEPOMIS MACROCHIRUS),
National Water Quality Lab., Duluth, Minn.
D. A. Benoit.
Transactions of the American Fisheries Society, No 2, p 353-358, 1975. 4 tab, 19 ref.

Descriptors: *Copper, *Sunfishes, Survival, Growth rates, Path of pollutants, *Toxicity, Water quality, Fish physiology, Fish reproduction, Water pollution effects, Lethal limit.
Identifiers: *Bluegills, Lepomis macrochirus, Bioaccumulation, Tissue analysis.

During a 22-month exposure of bluegills (Lepomis macrochirus) to copper in soft water, adult bluegill survival was reduced, growth was retarded, and spawning was inhibited. Significant quantities of copper had accumulated in the gills and liver. The maximum acceptable toxicant concentration was between 21 and 40 micrograms Cu/liter. (Klein)
W76-01906

RESISTANCE OF A NORTHWESTERN CRAYFISH, PACIFASTACUS LENIUSCULUS (DANA) TO ELEVATED TEMPERATURES,
Batelle Pacific Northwest Lab., Richland, Wash.
C. D. Becker, R. G. Genoway, and J. A. Merrill.
Transactions of the American Fisheries Society, No 2, p 374-387, 1975. 6 fig, 5 tab, 29 ref.

Descriptors: *Invertebrates, *Crayfish, *Temperature, *Heat resistance, Growth stages, Water quality, Salmonids, Thermal pollution, Water pollution effects.
Identifiers: Pacifastacus leniusculus, Egg bearing females, Sex difference.

The upper lethal temperature for crayfish, Pacifastacus leniusculus, was near 32-33 degrees C. Moulting individuals, pre-breeding mature females, and larger crayfish were less resistant to high temperature stress than egg-bearing females, small crayfish, and males. P. leniusculus were more tolerant of elevated temperatures than native salmonids, but less tolerant than some introduced 'warmwater' fish. (Klein)
W76-01907

A SIMPLE DOSING SYSTEM FOR CONTINUOUS STREAM DOSING,
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
For primary bibliographic entry see Field 7B.
W76-01908

RELATIONSHIPS BETWEEN SEDIMENT OIL CONCENTRATIONS AND THE MACROINVERTEBRATES PRESENT IN A SMALL STREAM FOLLOWING AN OIL SPILL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
R. C. Hoehn, J. R. Stauffer, M. T. Masnik, and C. H. Hocutt.
Environmental Letters, Vol 7, No 4, p 345-352, 1974.

Descriptors: *Oil spills, Streams, *Oil pollution, *Biological communities, *Sediments, Aquatic animals, *Benthos, Environmental effects, Water pollution sources, Water pollution effects, Toxicants, Toxicity, Virginia.
Identifiers: Species diversification, *Sediment oil analysis.

A study was conducted to assess the effects of an oil spill on the macroinvertebrate populations in a small creek in Virginia. Sediments were extracted with hexane, and the residue concentrations were correlated with the numbers and diversities of macroinvertebrates collected downstream of the spill. Based on the available data, it was concluded that the effect of the oil spill was a toxic one rather than one of rendering the sediments unsuitable for colonization. (Katz)
W76-01910

CHEMICAL ANALYSIS OF TRACE ELEMENTS IN ICELAND GEYSIRS WITH REMARKS ON MASTIGOCLADUS LAMINOSUS COHN,
Copenhagen Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W76-01912

STATUS OF UPTAKE OF MERCURY BY THE FRESH WATER DIATOM, SYNEDRA ULNA,
Institute of Public Health, Tokyo (Japan).
M. Fujita, and K. Hashizume.
Water Research, Vol 9, No 10, p 889-894, October 1975. 6 fig, 4 tab, 10 ref.

Descriptors: *Diatoms, *Heavy metals, *Mercury, Aquatic microorganisms, Microbiology, Path of pollutants, Metabolism, Plant physiology, Phytoplankton, Plankton, Food chains.
Identifiers: *Synedra ulna, Bioaccumulation, Tissue analysis.

Synedra, a fresh water diatom, took up mercuric chloride rapidly from the surrounding water into the cells attaining the maximum level during the first 7h. The comparison of mercury uptake by dividing cells was that of non-dividing, heat killed cells and their silicate shells showed that some factors other than cell-division or photosynthesis were responsible for mercury uptake by Synedra cells. About 20% of the total amount of mercury found in dividing cells was taken up by passive adsorption and could be eliminated by washing with distilled water or medium. About 50% of the mercury could not be eluted even with cysteine solution and was accumulated in the inner part of cells. Syndera took up 0.45 micro-m filterable or ionic mercury rather than particulate mercury larger than 0.45 micro-m. (Klein)
W76-01913

COMPARATIVE DISCHARGES OF FRESH AND WASTE WATER ALONG THE CALIFORNIA COAST,
California Univ., Santa Cruz. Earth Sciences Board.
For primary bibliographic entry see Field 5B.
W76-01914

TRACER EXPERIMENTS ON THE EFFECT OF MICRONUTRIENTS ON THE GROWTH OF PORPHYRA PLANTS-II MANGANESE-54 AND ZINC-65 ASSIMILATION IN RELATION TO ENVIRONMENTAL FACTORS,
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
J. Tsukidate.
Bulletin of the Nansei Regional Fisheries Laboratory, No 7, p 9-18, August 1974. 10 fig, 2 ref.

Descriptors: *Tracers, *Nutrients, *Aquatic plants, Manganese, Zinc, *Radioisotopes, *Growth rates, Laboratory tests, Analytical techniques, Environmental effects, Water pollution effects.
Identifiers: *Bioaccumulation, *Porphyra, *Manganese-54, *Zinc-65.

The amounts of manganese-54 and zinc-65 assimilated by Porphyra plants under various environmental conditions were investigated. The rates of assimilation were primarily dependent on the concentrations of the isotopes themselves. The manganese-54 assimilation was also affected by pH. Its maximum assimilation in artificial sea water at 9-10 degrees C, pH 8.2 and 3,000 lux, was 0.00135 microgram per 50.24 sq mm thallus piece. The maximum amount of zinc-65 assimilation in artificial sea water at 9-10 degrees C,pH 9, and 3,000 lux, was 0.0043 microgram per 50.24 sq mm thallus piece. (Klein)
W76-01916

STUDIES ON THE ANESTHETIC EFFECTS OF EUGENOL TO KURUMA PRAWN JUVENILES (IN JAPANESE),
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
H. Ishioka, O. Fukuhara, and S. Sakaguchi.
Bulletin of the Nansei Regional Fisheries Research Laboratory, No 7, p 31-42, August 1974. 7 fig, 5 tab, 7 ref.

Descriptors: *Crustaceans, *Animal physiology, *Organic compounds, Survival, Growth rates, Laboratory tests, Water pollution effects.
Identifiers: *Kuruma prawns, Penaeus japonicus, *Anesthesia, *Eugenol, Bioaccumulation.

Kuruma prawn (Penaeus japonicus) juveniles were found to be anesthetized between 50-200 ppm concentrations of Eugenol. Higher concentrations and water temperature shortened anesthetizing time. Most prawns recovered from the anesthesia within one hour except at low water temperatures. Starvation, molting and low chlorinity of the medium affected the anesthetizing time. Physiological conditions increasing water content of the prawns seemed to shorten the anesthetizing time. The Eugenol treatment appeared to have no serious affect on the growth and survival of the juvenile prawns. (Klein)
W76-01917

A RESPIROMETER TECHNIQUE FOR EVALUATING THE POTENTIAL EFFECTS OF RAPID THERMAL CHANGES TO SMALL AQUATIC ORGANISMS,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
L. B. Richardson, D. T. Burton, and S. L. Margrey.
The Progressive Fish-Culturist, Vol 37, No 1, p 57-58, January 1975. 2 fig, 2 ref.

Descriptors: *Methodology, Technology, *Respiration, Temperature, Oxygen requirements, Aquatic animals, Laboratory tests, Water pollution effects, *Thermal pollution, Pollutant identification.
Identifiers: *Respirometers.

A system was designed for thermal entrainment studies. A modified respirometer was used for determining pre-stress oxygen consumption, and

subsequent post-stress O2 levels to evaluate potential physiology adjustments of small aquatic organisms at various temperatures. (Klein)
W76-01920

TRANSLOCATION OF HYDROCARBONS IN AQUATIC FOOD CHAINS,
California Univ., Davis. Dept. of Animal Physiology.
R. W. Brocksen, and A. W. Knight.
In: Summary Report 1974, Food Protection and Toxicology Center, University of California, Davis p 15-19, 2 fig.

Descriptors: *Shrimp, *Organic compounds, *Respiration, *Toxicity, Environmental effects, *Food chains, *Lethal limit, *Bioassay, Laboratory tests, Feeding rates, Behavior, Water pollution effects, Pollutants, Toxicants, Shellfish, California.
Identifiers: Crago franciscorum, Crago migricandata, *Kelthane, *Sublethal effects, San Pablo Bay(Calif).

The effect of kelthane, a chlorinated hydrocarbon, on the growth, respiration, accumulation, feeding, molting and behavior of the San Pablo Bay shrimp, Crago franciscorum and C. nigricandata were investigated. This shrimp is a primary food source for endemic and migrating fishes. The 96-hr LC50 kelthane for Crago at 19 degrees C and 19% salinity was 200 ppb. The lethal threshold was close to 110 ppb kelthane. The chronic bioassay 192-hr LC50 at 16C and 19% salinity was 34ppb and the lethal threshold was 14-33ppb. Kelthane appeared to depress respiration, and feeding and altered normal behavior patterns. (Katz)
W76-01921

PATHOGENICITY STUDIES WITH A STREPTOCOCCUS SP. ISOLATED FROM FISHES IN AN ALABAMA-FLORIDA FISH KILL,
Gulf Coast Research Lab., Ocean Springs, Miss. Microbiology Section.
D. W. Cook, and S. R. Lofton.
Transactions of the American Fisheries Society, No 2, p 286-288, 1975. 2 tab, 1 ref.

Descriptors: *Fish diseases, *Fishkill, *Streptococcus, *Bacteria, Water quality, Microbiology, Water pollution effects, Pathology, *Pathogenic bacteria.
Identifiers: *Pathogenicity studies, Atlantic croaker, Sea catfish, Gulf menhaden, Striped mullet, Spot, Micropogon undulatus, Arius felis, Brevoortia patronus, Mugil cephalus, Leistomus xanthurus.

A Streptococcus sp. isolated from moribund fish in a 1972 Alabama-Florida fish kill produced mortalities in five species of fish involved in the kill. Pathogenicity studies with six non-fish-related streptococci were also conducted on two of the fishes. (Klein)
W76-01922

STIMULATION AND INHIBITION OF PHYTOPLANKTON GROWTH BY LOW MOLECULAR WEIGHT HYDROCARBONS,
Skidaway Inst. of Oceanography, Savannah, Ga.
W. M. Dunstan, L. P. Atkinson, and J. Natoli.
Marine Biology, Vol 31, No 4, p 305-310, 1975. 2 fig, 1 tab, 20 ref.

Descriptors: *Organic compounds, *Phytoplankton, *Growth rates, *Oil wastes, Water pollution sources, Analytical techniques, Water pollution effects.
Identifiers: *Bioaccumulation, *Benzene, *Toluene, Xylene, Amphidinium carterae, Dunaliella tertiolecta, Skeletonema costatum, Cricosphaera carterae.

Experiments on 4 different phytoplankton exposed to a range of concentrations in culture of benzene, toluene and xylene showed a variety of growth responses for marine microalgae. Stimulation of growth in Dunaliella tertiolecta resulted from low microgram per liter concentrations of all three compounds, Skeletonema costatum showed no growth enhancement, while Cricosphaera carterae and Amphidinium carterae were intermediate in their reactions. The species-specific stimulation of low concentrations was further shown in experiments with mixtures of No 2, fuel oil. The volatile fraction was most biologically reactive, being the source of growth enhancement at low levels and a major growth inhibitor at high concentrations. (Klein)
W76-01923

FACTORS AFFECTING THE ACCUMULATION AND REMOVAL OF MERCURY FROM TISSUES OF THE AMERICAN OYSTER CRASSOSTREA VIRGINICA,
Delaware Univ., Newark. Dept. of Biological Sciences.
P. A. Cunningham, and M. R. Tripp.
Marine Biology, Vol 31, No 4, p 311-319, 1975. 3 fig, 5 tab, 29 ref.

Descriptors: *Oysters, *Heavy metals, *Mercury, Path of pollutants, Animal physiology, Analytical techniques, Water pollution sources, Temperature, Water pollution effects.
Identifiers: *America oysters, *Bioaccumulation, *Tissue analysis.

Adult oysters, Crassostrea virginica, were held in seawater containing 10 to 100 parts per billion mercury. After 45 days mercury tissue concentration was 91,600 and 12,100 ppb in the 100 and 10 ppb mercury groups, respectively. The biological half-life of mercuric acetate was 16.8 and 9.3 days in a 25 degree temperature regime, and 35.4 and 19.9 days in a declining (25 to 5 degrees) temperature regime. Smaller oysters (0-7 grams) consistently accumulated more mercury per gram wet weight than larger oysters. (Klein)
W76-01924

TOTAL MERCURY IN SOME FISH AND SHELLFISH ALONG THE MEXICAN COAST,
Pennsylvania State Univ., University Park.
A. A. Reimer, and R. D. Reimer.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 1, p 105-111, July 1975. 4 tab, 15 ref.

Descriptors: *Heavy metals, *Toxicity, Path of pollutants, *Shrimp, *Mollusks, *Fish, *Mercury, Water quality, Environmental effects, Fish physiology, Mullets, *Mexico, Water pollution effects.
Identifiers: *Bioaccumulation, Grey mullet, Mugil cephalus, Anisotremus interruptus, Diapterus, Codakia orbicularis, Tissue analysis, Penaeus, Muscle, Liver, Andara, Crassostrea virginica.

The mercury content found in muscle and liver of three species of fish-grey mullet Mugil cephalus, Anisotremus interruptus, and Diapterus from several Mexican localities ranged from 0.01-0.38 micrograms/gram in the muscle and 0.01-0.47 micrograms/gram in the liver. In all species investigated the mercury content of the liver was higher, sometimes more than double, that of the muscle. Value of mercury is shrimp (Penaeus) ranged from 0.01-0.67 micrograms/gram. Mercury contents in mollusks were low, except in the tiger lucine, Codakia orbicularis. (Klein)
W76-01925

INFLUENCE OF NAC1, CA2+, AND MG2+ ON THE GROWTH OF A MARINE BDELLOVIBRIO SP.,
Otago Univ. Dunedin (New Zealand). Dept. of Microbiology.
R. G. Bell, and D. J. Latham.
Estuarine and Coastal Marine Science, Vol 3, No 3, p 381-384, July 1975. 1 tab, 7 ref.

Descriptors: *Sewage, *Ions, *Salts, *Bacteria, Microorganisms, Sewage bacteria, Sodium chloride, Magnesium, Calcium cultures, E. Coli, Growth rates, Speciation, Water pollution effects.
Identifiers: *Marine bdellovibrio, Bacteriology.

A marine bdellovibrio was isolated from sewage-polluted coastal water, with Escherichia coli K12 as host organism, using a polyethylene bag humidor incubation technique. The isolate was able to grow only on sea water or 1.5%-5% NaC1-based yeast-peptone medium. Growth of the isolate was strongly stimulated by the addition of 0.002 M-Ca2+/and 0.002 M-Mg2+/to the NaC1-based medium. It was concluded that the isolate was halophilic and thus should be considered as distinct from, but related to, terrestrial strains. (Klein)
W76-01926

STUDIES ON THE EFFECTS OF TEMPERATURE ON EGG LAYING OF THREE SPECIES OF CALANOID COPEPODS IN THE LABORATORY (ACARTIA TONSA, TEMORA LONGICORNIS, PSEUDOCALANUS ELONGATUS),
Dalhousi Univ., Halifax (Nova Scotia). Dept. of Biology.
C. J. Corkett, and E. J. Zillioux.
Bulletin of the Plankton Society of Japan, Vol 21, No 2, p 77-85, April 1975. 1 fig, 2 tab, 22 ref.

Descriptors: *Copepods, *Temperature, Growth stages, Life cycles, Fertility, Populations, Growth rates, Fecundity, *Thermal pollution, Water pollution effects.
Identifiers: *Acartia tonsa, *Temora longicornis, *Pseudocalanus elongatus, Egg production.

A study of egg production in artificial sea salt over a range of temperature showed that the rate of egg production in the sac-carrying copepod Pseudocalanus elongatus was lower than that found in Acartia tonsa and Temora longicornis, which lay single eggs. It was suggested that carrying eggs attached to the females in sacs may limit the maximum egg production rate (maximum fecundity) since a new sac cannot be laid until the old one hatches. (Klein)
W76-01927

DRASTIC REDUCTION OF THE WHITE PERCH, MORONE AMERICANA, POPULATION IN THE JAMES RIVER, VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
R. A. St. Pierre, and W. J. Hoagman.
Chesapeake Science, Vol 16, No 3, p 192-197, September 1975, 2 fig, 3 tab, 15 ref.

Descriptors: *White perch, *Populations, *Fishkill, Trawling, Commercial fishing, Water quality, *Virginia, Water pollution effects.
Identifiers: *James River(Va).

The white perch population in the James River declined to near extinction by the summer of 1971. Only several individuals were captured after extensive trawling and beach seining in 1972 and 1973, whereas similar effort yielded thousands in previous years. The commercial catch simultaneously dropped to an all-time low. The cause of the population plummet apparently was a massive fish kill in May of 1971. The precise cause of the fish kill was not determined. (Klein)
W76-01928

MARINE MEIOFAUNA OF A NEW YORK CITY BEACH WITH PARTICULAR REFERENCE TO TARDIGRADA,
City Coll., New York. Dept. of Biology.
E. A. Martinez.
Estuarine and Coastal Marine Science, Vol 3, No 3, p 337-248, July 1975. 5 fig, 3 tab, 56 ref.

Descriptors: Beaches, *Microorganisms, *Nematodes, Sediments, Sampling, Water quality, Effluents, Sewage, Population, New York.
Identifiers: *Marine Meiofauna, *Tardigrades, Batillipes mirus, Batillipes pennaki, *New York Ctiy beaches.

Distribution and abundance of meiofauna of a New York City beach were studied. Environmental variables included particle size distribution, temperature, salinity, and interstitial water content. The substratum consisted of quartz. Both temperature and salinity were greatly influenced by adjacent offshore sea water. Nematodes were the dominant taxon, averaging 85.5% of the total collection. Tardigrades represented 6%, including Batillipes mirus and B. pennaki. (Klein)
W76-01930

HYDROGEN PEROXIDE AS A SOURCE OF OXYGEN SUPPLY IN THE TRANSPORT OF FISH FRY,
Institute of Science, Nagpur (India). Dept. of Zoology.
For primary bibliographic entry see Field 5G.
W76-01931

A POSSIBLE REACTION OF ATLANTIC SALMON (SALMO SALAR) TO INJECTED CHLORAMPHENICOL,
Michigan Dept. of Natural Resources, Lansing. Fisheries Div.
V. E. Bennett.
The Progressive Fish-Culturist, Vol 37, No 2, p 114, April 1975.

Descriptors: *Salmonids, *Atlantic salmon, *Fish physiology, *Organic compounds, Spawning, Bacteria, Toxicity, Fish diseases, Michigan, Water pollution effects.
Identifiers: *Chloramphenicol, Bioaccumulation, Boyne River(Mich).

Atlantic salmon (Salmo salar) returning to Michigan's Boyne River appeared to be undergoing physiological stress. Transfer of fish to a more suitable environment was initiated. The injection of transferred fish with chloramphenicol was attempted to reduce the mortality due to bacterial infections. Mortalities occurred and fish were peppered with reddish-colored nodules resembling allergic hives. (Klein)
W76-01932

AN ULTRAVIOLET SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF NAPHTHALENE AND ALKYLNAPHTHALENES IN THE TISSUES OF OIL CONTAMINATED MARINE ANIMALS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-01933

STUDIES ON DEATH OF FISH CAUSED BY RED TIDE, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
T. Matsusato, and H. Kobayashi.
Bulletin of the Nansei Regional Fisheries Research Laboratory, No 7, p 43-68, August 1974; 22 fig, 2 tab, 30 ref.

Descriptors: Fish, *Fish physiology, *Respiration, *Red tide, *Plankton, *Fish toxins, Oxygen requirements, Fish behavior, Mortality, Water pollution effects, Fishkill.
Identifiers: Red Sea Bream, Chrysophrys major, Yellow trail, Asphyxiation, Seriola quinqueradiata, Hemieutreptia antiqua.

The influences of the red tide on the red sea bream, Chrysophrys major, and the cultured yellow tail, Seriola quinqueradiata, were investigated in their use of the marine plankton, Hemieutreptia antiqua. Breathing rate, heart pulsation rate, and other physiological effects were investigated in both species. Oxygen levels and fish behavior were recorded. The cause of death of the fish attributed to the red tide was based on asphyxiation due to interception of the ventilation water in the branchia. (Klein)
W76-01934

EXCESS NITROGEN GAS IN WATER NOT A CAUSE OF COAGULATED YOLK DISEASE IN CHINOOK SALMON,
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
R. R. Rucker.
The Progressive Fish-Culturist, Vol 37, No 2, p 101-102, April 1975. 1 fig, 1 tab, 2 ref.

Descriptors: *Chinook salmon, *Salmonids, *Nitrogen, *Dissolved oxygen, Growth stages, Fish eggs, Fry, Fish physiology, Fish diseases, Toxicity, Water pollution effects.
Identifiers: Bioaccumulation.

No evidence of white spot or coagulated yolk disease from the exposure of excess nitrogen in water to chinook salmon (Oncorhynchus tshawytscha) eggs and fry was observed. Fingerlings showed peduncle deformities possibly resulting from oxygen deficiency during egg stage. (Klein)
W76-01935

EFFECTS OF AGRICULTURAL LIMESTONE ON WATER CHEMISTRY, PHYTOPLANKTON PRODUCTIVITY, AND FISH PRODUCTION IN SOFT WATER PONDS,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
R. G. Arce, and C. E. Boyd.
Transactions of the American Fisheries Society, No 2, p 308-312, 1975, 2 fig, 4 tab, 16 ref.

Descriptors: *Tilapia, *Primary productivity, *Limestone, Fish, Ponds, Water quality, Fertilizers, *Phytoplankton, Water pollution sources, Nitrates, Phosphates, Hydrogen ion concentration, Water chemistry, Hardness(Water), Food chains, Water pollution effects.
Identifiers: Tilapia aurea, Fish culture.

Five ponds treated with agricultural limestone and five control ponds were stocked with Tilapia aurea and fertilized every two weeks with ammonium nitrate and triple superphosphate. Initially, total hardness and total alkalinity of the waters in the 10 ponds averaged 7.8 and 13.7 mg/liter, respectively. Liming caused a fourfold increase in total hardness and total alkalinity. Limed ponds had higher rates of phytoplankton productivity and yielded a 25% greater weight of fish than control ponds. (Klein)
W76-01936

ZOOPLANKTON ENTRAINMENT AT THREE MID-ATLANTIC POWER PLANTS,
Henningson, Durham and Richardson Inc., Santa Barbara, Calif. Ecosciences Div.
R. M. Davies, and L. D. Jensen.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2130-2142, August 1975, 9 fig, 2 tab, 14 ref.

Descriptors: *Zooplankton, *Power plants, *Water quality, Survival, Water cooling, Temperature, Chlorine, Sampling, Thermal pollution, Water pollution effects.
Identifiers: *Entrained zooplankton, Thermal tolerance.

The change in mortality of zooplankton resulting from entrainment into cooling water systems depended on the interaction of ambient temperature, temperature rise, mechanical stress, and chlorine levels when applied. Analysis of zooplankton survival to quantity delayed mortality or impaired reproductive potential was found necessary to ascertain the fate of entrained plankton, which may have been otherwise hidden by dilution in the mixing zone of the discharge canal. Population changes between the intake, the discharge, and receiving water were studied for estimation of survival of entrained zooplankton. (Klein)
W76-01937

THE DYNAMICS OF METALS IN THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA. I. SEASONAL EFFECTS,
Johns Hopkins Univ., Baltimore, Md. School of Hygiene and Public Health.
J. M. Frazier.
Chesapeake Science, Vol 16, No 3, p 162-171, September 1975. 4 fig, 4 tab, 33 ref.

Descriptors: *Oysters, *Mollusks, *Animal physiology, *Metals, Metabolism, Path of pollutants, Cadmium, Manganese, Zinc, Copper, Growth rates, Water pollution effects.
Identifiers: *American oysters.

Different patterns of metal dynamics were observed as a result of the reduction in biological variation realized by employing genetically similar American oysters, Crassostrea virginica. Mn and Fe concentrations in soft tissues were significantly correlated with shell deposition. A high rate of Mn turnover in soft tissues occurred during the shell growth season. Zn and Cu body burdens exhibited a gradual increase during the spring and summer followed by a rapid loss during August-September in which 33% of the Zn and 50% of the Cu was lost in 4 weeks. Cd behavior was similar to that of Cu and Zn. (Klein)
W76-01938

THE INFLUENCE OF EMBANKMENTS ON THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN THE ARCHIPELAGO OF FOGLO, ALAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
J. Westerberg.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, No 239, p 78-82, 1975. 2 fig, 4 ref.

Descriptors: *Embankments, *Primary productivity, *Phytoplankton, *Channels, Environmental effects, Water quality, Benthic flora, Currents(Water).
Identifiers: *Finland(Archipelago of Foglo).

The primary production of phytoplankton was measured in situ by the 14C method at three localities with embankments. The stations were all situated in long channels, where water currents are a more important ecological factor than wave action. The embankments create stagnant conditions, or considerably decrease the flow of water. At some of the stations the macrophytes formed a carpet on the bottom in shallow water, and phytoplanktonic primary production seemed to be inversely related to the density of the bottom vegetation. However, there were indications that the total production of aquatic plants increased in places where embankments influenced the flow of water. (Klein)
W76-01940

EUTROPHICATION AND MASS PRODUCTION OF BLUE-GREEN ALGAE IN THE BALTIC,
Kiel Univ., (West Germany). Institut fuer Meeresforschung.
U. Horstmann.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 83-90, 1975. 2 fig, 3 tab, 28 ref.

Descriptors: *Primary productivity, *Cyanophyta, *Water quality, Population, Food chains, Food webs, Life cycles, Algae, Water pollution effects.
Identifiers: Aphanizomenon flos-aquae, Nodularia spumigena, *Baltic Sea

Mass occurrences of the blue-green algae Aphanizomenon flow-aquae and Nodularia spumingena have been observed more often in the Baltic proper during the last few years. The present paper touched on some questions connected with the mass-production of Cyanophyceae, such as the origin of the blue-green algae blooms, their limitation by nutrients, their nitrogen fixation and their role as nitrate suppliers. The agglomeration of blue-green algae was shown to be a biotic community, and some relations of these algae in the food web were examined. Some results of in situ experiments and recent laboratory investigations were given. (Klein)
W76-01941

EFFECT ON DETERGENTS AND OF PHOSPHO-GYPSUM ON THE OXYGEN AND CHLOROPHYLL A LEVELS AND ON THE DRY WEIGHT OF THE RESIDUE OF BRACKISH WATER UNDER LABORATORY CONDITIONS,
Medical Academy, Gdansk (Poland). Dept. of Biology.
Z. Zbytniewski, G. Drewa, and F. Pautsch.
In: Proceedings of the 3rd Baltic Symposium on Marine Science, Helsinki, No 239, p 100-104, 1975. 5 tables, 15 ref.

Descriptors: *Water quality, *Detergents, *Phosphorus compounds, *Oxygen, *Chlorophyll, Water pollution sources, Laboratory tests, Brackish water, Eutrophication.
Identifiers: *Phospho-Gypsum, Chlorophyll A.

During the first two weeks of the laboratory experiment the oxygen and chlorophyll a levels of all the detergent and phospho-gypsum solutions were lower than in the control aquarium. Observations indicated that detergents in low concentrations and phospho-gypsum in 0.20% or weaker solutions developed a eutrophying effect after several weeks of incubation under laboratory conditions. (Klein)
W76-01942

ABOVE GROUND PRODUCTION AND CHEMICAL ANALYSIS OF PHRAGMITES COMMUNIS IN POLLUTED BRACKISH WATER,
Stockholm Univ. (Sweden). Botany Inst.
H. -G. Wallentinus.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 109-115, 1975. ! fig, 1 tab, 7 ref.

Descriptors: Technology, *Submerged plants, Nitrogen, Phosphorus, Biomass, Analytical techniques, Chemical analysis, Water quality, Stagnant water, Sodium, Potassium, Magnesium, Calcium, Brackish water.
Identifiers: *Phragmites communis, *Reeds culms.

The two aims of this investigation were to develop a simple method for the determination of the above ground biomass of reed-beds and to investigate the distribution of certain ions in the read culm, Phragmites communis. The culms were harvested down to and including the upper parts of the rhizomes. The culms were dried and the stems were cut into 10-cm sections and weighed. From these weights formulas were constructed, where the total weight of the culm aove the water surface, the weight of the stem at the water surface, and the water depths were inputs, giving the weight of the entire culm. Diving was thus necessary only for collecting the material for estimating the formula constants. The dried material was then ground, wet combusted and analyzed for N,P and certain cations. The maximum concentrations of N and P were found in the physiologically active parts, whereas the cations showed a more heterogeneous distribution. (Klein)
W76-01943

ON THE INFLUENCE OF SEWAGE POLLUTION ON INSHORE BENTHIC COMMUNITIES IN THE SOUTH OF KIEL BAY. PART I. QUALITATIVE STUDIES ON INDICATOR SPECIES AND COMMUNITIES,
Kiel Univ., (West Germany). Zoologisches Institut.
K. Anger.
In: Proceedings on the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 116-122, 1975. 6 fig, 1 tab, 10 ref.

Descriptors: *Bioindicators, *Biological communities, Marine animals, Bivalves, Amphipoda, Water pollution sources, Water quality, *Sewage, *Grasses, Sands, Bays, Water pollution effects.
Identifiers: *Polychaetes, Eelgrasses, Mytillus, Batyporeia sarsi, Nephthys caeca, Scoloplos armiger, Eteone longa, Cardium lamarcki, *Kiel Bay(Germany).

A qualitative benthos was done in the western Baltic to determine indicator species and communities. Degree of sewage pollution and type of substrate were considered. The amphipod Batyporeia sarsi, the polychaetes Nephthys caeca, Scoloplos armiger, and Eteone longa, and the bivalve Cardium lamarcki were found to be suitable bioindicators. Sand and eelgrass were considered best indicator communities. (Klein)
W76-01944

REMARKS ON INDICATOR ORGANISMS (MEIOFAUNA) IN THE COASTAL WATERS OF THE GDR,
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
For primary bibliographic entry see Field 5B.
W76-01946

EFFECTS OF A SULPHATE PULP MILL ON THE BENTHIC MACROFAUNA IN A FIRTH OF THE BOTHNIAN SEA,
Swedish Water and Air Pollution Research Lab., Goteborg.
R. Rosenberg, K. Nilsson, and L. Lander.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 289-300, 1975. 7 fig, 2 tab, 14 ref.

Descriptors: *Marine animals, *Pulp wastes, *Benthic fauna, Industrial wastes, Sulfates, Water pollution sources, Sewage, Animal physiology, Toxicity, Crustaceans, Path of Pollutants, Bivalves, Water pollution effects.
Identifiers: *Benthic macrofauna, *Pulp mills, Pontoporeia affinis, Macoma baltica, Mesidothea entoman, Shell growth, Kraft pulping wastes, *Bothnian Sea.

Natrafjarden, a firth in the Bothnian Sea, receives a yearly discharge of organic wastes from a sulphate pulp mill equivalent to about 8000 tons BOD7. The firth is covered with ice for about 4 months of every year and the salinity below a depth of 10m is 5-6% parts per thousand. The organic wastes were transported in the surface water and oxygen depletion was not observed during the investigation period 1969-1972. The benthic macrofauna was sampled at 32 stations (depth 5-57 m), 12 of which were azoic, comprising an area of about 1 km2. Four communities were distinguished with respect to depth and pollution. The most frequently found species were Pontoporeia affinis and Macoma baltica and Mesidothea entomon, of which the two latter were most tolerant of pollution. Shell growth of Macoma and recruitment of Pontoporeia were reduced in polluted areas. Comparisons were made with the fauna of other polluted areas. (Klein)
W76-01947

CHANGES IN PLANKTON RESULTING FROM EUTROPHICATION OF A BALTIC FIRTH,
Gdansk Univ. (Poland). Inst. of Oceanography.
K. Wikor, and M. Plinski.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 311-315, 1975. 4 fig, 7 ref.

Descriptors: *Primary productivity, *Eutrophication, *Phosphates, Water pollution effects, Wastes, Systematics, Polulation, Water quality, *Plankton.
Identifiers: *Baltic Sea.

Research on plankton was carried out in 1955-1972 in the Szczecin Firth. Phosphate concentration increased 5-20 times the level in 1955, probably due to industrial and agricultural pollution. Pollution also caused increased plankton production as well as changing the plankton diversity composition. (Klein)
W76-01948

THE EFFECTS OF FERRY TRAFFIC ON ROCKY SHORE VEGETATION IN THE SOUTHERN ALAND ARCHIPELAGO,
Abo Akademi, Turku (Finland). Inst. of Biology.
O. Ronnberg.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 325-330, 1975. 3 fig, 1 tab, 9 ref.

Descriptors: *Transportation, *Algae, *Littoral, Benthos, Sampling, Biomass, Waves(Water), Population, Methodology, Navigation, Water pollution effects.
Identifiers: *Ferry traffic, Water action, *Littoral zones, Macroalgae, Verrucaria maura, Fucus cesiculosus, *Finland(Aland Archipelago).

The vertical extent of littoral and sublittoral macroalgae along 10 test lines with different degrees of exposure was investigated by means of skin diving. Along the lines directly exposed to the fairway hydrolittoral filamentous algae were found at depths between 0.3 and 1.8 m, while the normal depth for such algae was 0.2-0.6m. The biomass on lines directly exposed to the fairway was 30% less in the hydrolittoral zone and 50% less in the sublittoral zone than on lines sheltered from the ferries' wash. The force of the wash on the shore was measured with spring dynamometers at different distances from the fairway. (Klein)
W76-01949

THE EFFECTS OF FERRY TRAFFIC ON THE ROCKY SHORE MACROFAUNA IN THE SOUTHERN ALAND ARCHIPELAGO: I. THE CLADOPHORA ZONE,
Abo Akademi, Turku (Finland). Inst. of Biology.
H. -R. Fagerholm.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 331-337, 1975. 6 fig, 1 tab, 10 ref.

Descriptors: *Sampling, *Marine animals, *Biomass, Methodology, Navigation, Transportation, Waves(Water), Sampling, Population, *Cladophora.
Identifiers: Ferry traffic, Water action, Finland(Aland Archipelago), *Baltic Sea.

Quantitative macrofauna samples were taken in the Cladophora zone, using an acrylic plastic frame (400cm2). The sampling localities were situated in the northern Baltic at different distances from the navigation route used by ferries passing regularly through narrow straits in the Finnish and Swedish archipelagoes. Two localities were investigated monthly for one year. The composition of the macrofauna is given. The mean biomasses were 1.4 grams/meter2(fresh wt) in the locality close to the fairway and 19.1 grams/meter2in the controlled locality. The corresponding individual numbers were 806/meter2 and 7271/meter2. A simple dynamometer was used to measure the dynamic pressure in the swell acting upon the shores at different distances from the fairway. (Klein)
W76-01950

ALGAL ZONATION ON ROCKY SHORES OUTSIDE HELSINKI AS A BASIS FOR POLLUTION MONITORING,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
L. Lindgren.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 344-347, 1975. 1 fig.

Descriptors: *Water pollution sources, *Eutrophication, *Algae, Primary productivity, Water quality, Domestic wastes, Speciation, Bioindicators, *Monitoring, Sampling, Water pollution effects.
Identifiers: *Baltic Sea, *Helsinki(Finland), *Algal zonation, Pollution gradients, Sphacelaria artica, Eurcellaria fastigiata.

The three typical vegetation belts of the Baltic (green, brown, and red algal belts) could not be distinguished in the most polluted (entrophied) district, the inner archipelago of Helsinki. Elsewhere, slight deviations from the normal species composition of the Baltic were observed. The ecology and relative abundance of the individual species also differed from those in clean areas of the Baltic. (klein)
W76-01951

5D. Waste Treatment Processes

A BARGAINING APPROACH FOR PROGRAMMING LEAST-COST WASTE TREATMENT ALONG A RIVER,
North Carolina State Univ., Raleigh. Dept. of Economics; and North Carolina State Univ., Raleigh. Dept. of Business.
D. Airan, J. A. Seagraves, and D. S. Airan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-108. $4.50 in paper copy, $2.25 in microfiche. University of North Carolina Water Resources Research Institute UNC-WRRI Report No 109, August 1975, 62 p, 5 fig, 8 tab, 18 ref, 3 append. OWRT B-054-NC(4). 14-31-0001-3952.

Descriptors: *Cost allocation, *Waste water treatment, *Costs, Standards, *Optimization, Model studies, Permits, *Cost comparisons, *North Carolina.
Identifiers: *Neuse River(NC), Waste discharges, *Discharge permits, Discharge charges, Least costs, Optimum solutions, *Treatment levels.

A model is developed for minimizing waste treatment costs to achieve a given stream standard. An optimum set of treatment levels is calculated using available information about the cost of waste treatment and the effects of waste in different reaches with an assumed procedure for bargaining among waste dischargers. Each discharger is assumed to be responsible for the quality of water in his reach. The optimum solution suggests an optimum set of discharge permits and charges, However, it does not favor any one administrative system or distribution of costs. The model is run to find optimum or least-cost waste treatment levels for the Neuse River of North Carolina. The optimum solution has much less treatment than is currently being used. The costs of present waste treatment are estimated to be $3.7 million per year while the cost of the optimum set of treatment levels is only $1.09 million. (Stewart-North Carolina)
W76-01504

SOLUBILIZATION AND WET OXIDATION OF SUSPENDED AND DISSOLVED ORGANICS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
J. R. Katzer.
Available from the National Technical Information Service Springfield, Va 22161 as PB247-106, $5.50 in paper copy, $2.25 in microfiche. Delaware Water Resources Center, Newark, Completion Report, September 1975. 97 p, 30 fig, 16 tab, 21 ref. OWRT A-027-DEL(1).

Descriptors: *Oxidation, Chemical reactions, Kinetics, Chemical degradation, Sludge disposal, Design, Evaluation, Ultimate disposal, *Waste water treatment, Economics, Sludge, *Organic wastes, Solubility.
Identifiers: Glucose, *Wet oxidation, Process design, Solubilization.

The aqueous-phase solubilization of yeast and the aqueous-phase oxidation of glucose were studied in an autoclave between 150 and 230 C and 0 to 470 psia 02 pressure. The rate of yeast solubilization was first order in solids concentration and involved both rapid oxidation and slower hydrolysis reactions. The aqueous-phase oxidation of glucose was first-order in glucose consumption and in total organic carbon (TOC) removal. Glucose consumption occurs by a thermal (hydrolytic or dehydrative) decomposition and an oxidative mechanism. The activation energy for both glucose oxidation and TOC removal and for yeast solubilization was about 17 kcal per mole. The cost for wet oxidation of sewage sludge was about the same as that for a wet and catalytic oxidation process. However, wet oxidation achieved only 70% COD reduction, whereas wer and catalytic oxidation produced 99% TOC removal.
W76-01506

OPTIMAL PLANNING OF REGIONAL WASTEWATER SYSTEMS AND THEIR IMPACTS ON STREAM QUALITY WITH A CASE STUDY OF THE CARSON RIVER BASIN,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-01524

SEWER LAYING SYSTEM,
For primary bibliographic entry see Field 8 .
W76-01533

APPARATUS AND METHOD FOR PRODUCING AIR BUBBLES IN A BODY OF LIQUID.
Canadian Patent 974,671. Issued September 16, 1975. Patent Office Record, Vol 103, No 37, p 37-72, September, 1975.

Descriptors: *Water pollution control, *Patents, *Bubbles, Equipment, Oil spills.
Identifiers: Surface water pollutants.

An apparatus and method for producing air bubbles in a body of liquid have been patented. The effectiveness of air barriers in restraining surface water pollutants is achieved by equalizing the air pressure in a perforated bubbling hose. An auxiliary distributing conductor carrying high pressured air and interconnected at intervals with the bubbling hose is utilized. (Waltner-FIRL)
W76-01535

RECOVERY SYSTEM FOR OXYGEN FROM WASTE WATER OXYGENATION,
Chicago Bridge and Iron Company, Oak Brook, Ill. (assignee).
K. W. Lange, and J. B. Maher.
United States Patent 3,909,409. Issued September 30, 1975. Official Gazette of the United States Patent Office, Vol 938, No 5, p 2396, September, 1975. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Oxygen, Biochemical oxygen demand, Gases, Carbon dioxide, Recycling.
Identifiers: Oxygen recovery.

A system for the recovery of oxygen from the oxygenation of waste water has been issued a patent. Substantially pure gaseous oxygen is introduced through waste water with a high biochemical oxygen demand (BOD). An effluent stream of gas containing oxygen mixed with nitrogen, carbon dioxide, water vapor, and other gases present in trace quantities is separated from the oxygenated waste water. The effluent stream of gas is fed into a pool of liquid oxygen. This solidifies the carbon dioxide and converts the water vapor to ice. A gas stream containing oxygen, nitrogen, and trace quantities of other gases is separated from the liquid oxygen. The gas stream is then cooled to a temperature sufficiently low to condense only the oxygen in the nitrogen. The condensed and liquified oxygen is separated from the nitrogen gas, and returned to the pool of liquid oxygen. Liquid oxygen is vaporized from the pool and used to treat additional waste water. (Orr-FIRL)
W76-01536

SEWAGE TREATMENT SYSTEM INCLUDING EFFLUENT EVAPORATOR,
Coate Burial Vault, Inc., West Milton, Ohio. (assignee)
K. J. Yost.
United States Patent 3,907,679. Issued September 23, 1975. Official Gazette of the United States Patent Office, Vol 938, No 4, p 1837, September, 1975. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Tanks, Equipment, Conduits, Effluents, *Evaporators.

A patented sewage treatment system is described which includes a tank buried within the ground. This tank has an inlet to receive sewage water and an outlet to discharge a clear water effluent. An evaporation device is provided to evaporate the effluent into the atmosphere. The evaporation equipment consists of an elongated flexible tubular conduit system of plastic material, which is arranged to form a substantially flat horizontal coil buried within the ground. This conduit system has an inlet end portion connected to the outlet of the tank which receives the effluent, an outlet end portion, and means to vent the outlet end portion to the atmosphere above the ground. This is accomplished by means of an air supply tube connected to the conduit system along several longitudinally spaced intervals of the conduit system. Thus, several air streams are produced into the conduit system, producing a longitudinal flow of air in a common direction within the upper portion of the conduit system for discharge as vapor to the atmosphere through the conduit system outlet. (Kramer-FIRL)
W76-01541

THE APPLICATION OF INCLINED TUBES OR PLATES TO SEDIMENTATION TANKS IN WASTEWATER TREATMENT.
Water Pollution Research Lab., Stevenage (England).
Notes on Water Pollution, No 68, March, 1975. 4 p, 19 ref.

Descriptors: *Separation techniques, *Sewage treatment, *Waste water treatment, *Sedimentation rates, Installation, Economics, Tertiary treatment, Activated sludge, Biological treatment, Flow rates, Treatment facilities, Design criteria, Overflow.
Identifiers: *Sedimentation tanks, Inclined tubes, Solids removal, Overloading.

The use of inclined tubes or plates in existing horizontal flow sedimentation tanks in order to increase the flow rate for solids removal has been investigated. These have been considered for sewage treatment facilities when the capacity of the facility has been exceeded by population increases, and extra sedimentation tanks have not been constructed to absorb the overloading. Inclined plates were originally produced commercially for the separation of oil and water and are still used for this purpose. While the installation of inclined tubes in existing horizontal-flow sedimentation tanks has been successfully done, the

procedure is recommended only if the temperature of the influent is not significantly higher (by more than one degree C) than the bulk liquid temperature, and if the module can be washed down once every few weeks or provision is made for in situ cleaning to prevent growth of algae. From experiments, it was found that sloping tubes or plates are suitable for uprating overloaded humus tanks, but are not applicable for final settlement tanks in the activated sludge process. They are not suitable for tertiary treatment without the use of a flocculant. If such tubes or plates are to be used, the sedimentation tank should be designed on the basis of overflow rate using the total plan area of the plates. While the cost of installing sloping tubes is less than the construction of a new tank, the plastic tube module will last no longer than ten years. Thus this procedure is suggested only where temporary overloading is the problem where a new plant will be built during the following ten years, or when there is a severe limitation on availability of land space. (Kramer-FIRL)
W76-01542

MIAMI PUSHES REGIONALIZATION TO KEEP PACE WITH POPULATION,
Miami-Dade Water and Sewer Authority, Fla.
J. J. Ritsema.
Water and Wastes Engineering, Vol 12, No 9, p 24-28, September, 1975. 2 fig, 3 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Waste water disposal, Sludge treatment, Sludge disposal, Florida, Sewerage, Infiltration, Regional development, Activated sludge, Landfill.
Identifiers: Miami(Fla).

The Miami-Dade Water and Sewer Authority has been expanding and regionalizing to keep up with the rapidly growing population of the area. The program is under the auspices of the Water Quality Management Plan (WQMP) for Dade County, Florida. The plan includes the expansion of the Virginia Key plant from 47 to 110 mgd, the construction of an 80 mgd plant, and a 50 mgd plant. A fourth regional waste water treatment plant (85 mgd) will be constructed in 1985. The Virginia Key plant is being expanded by the addition of aeration tanks, final settling tanks, and a 55 mgd pure oxygen activated sludge process without primary settling. Sludge will be processed by anaerobic digestion, heat treatment, dewatering, and use as a soil builder and landfill. The 80 mgd plant will use oxygen activated sludge. Some of the sewage that will be processed at this plant will be brackish due to salt water infiltration in the sewer lines. The sewage high in chlorides will be kept separate from the sewage low in chlorides, and the treatment plant units will be operated separately as saline or non-saline. Sludge from this plant will be treated at the Virginia Key facility. The 50 mgd plant will use a single stage oxygen activated process, sludge thickening, anaerobic digestion, heat treatment, dewatering, and sludge cake for soil building. Waste water disposal from the plants will be ocean outfall, injection wells, or reuse as cooling water. (Orr-FIRL)
W76-01546

SANITARY LANDFILLS: NO PLACE FOR LEACHING,
Richards of Rockford, Ill.
J. Goeppner.
Water and Wastes Enginering, Vol 12, No 9, p 47-50, 53, September, 1975. 7 fig.

Descriptors: *Waste water Treatment, *Leachate, *Landfills, Water pollution control, Biological treatment, Waste water disposal, Irrigation, Waste disposal, Groundwater, Costs, Treatment facilities, Plastic pipes, Aerated lagoons.
Identifiers: *Zero discharge.

Zero discharge of leachate from the inactive Jeffco Sanitary Landfill in Jefferson County, Missouri, has been accomplished by a process which includes collection, secondary biological treatment, and land disposal. The leachate system comprises a leachate collection and conveyance system; and aerated faculative lagoon component; a pumping station,; a force main; a surface ridge and furrow land irrigation system; and, a system of monitoring wells. Plastic pipe, installed two feet below the surface of the clay stratum, is used to collect leachate being generated along its entire length by gravity. An impervious plastic liner has also been inserted along the downhill sidewall and bottom of the construction trench. The aerated lagoon operates on the extended aeration principle utilizing a long detention time and a low ratio of organic loading. The expected overall removal of BOD is 85%. The secondarily treated effluent from the lagoon is discharged, using the ridge and furrow irrigation method, to a wooded ridge. An adjacent downslope eight-acre wooded area provides an additional infiltration area to prevent runoff from reaching a stream. Monitoring wells have been installed to determine the efficacy of the leachate collection and irrigation system, and to detect any detrimental effects on groundwater quality. The treatment facilities, pump station, and irrigation system are automatically operated. Total costs for acquisition, construction, and installation of the project were around $49,000. (Orr-FIRL)
W76-01550

LOWER SPEED AERATORS CUT ENERGY USE,
Bird Machine Co., South Walpole, Mass. Wastewater Treatment Equipment.
Water and Wastes Engineering, Vol 12, No 9, p 76-77, 79-80, September, 1975. 6 fig.

Descriptors: *Waste water treatment, *Aeration, Equipment, *Energy, Costs, Economics, Activated sludge, Capital costs, Impellers.
Identifiers: *Aerators.

Very low speed (VLS) aerators for waste water treatment processes can lower the costs of energy while increasing the oxygen transfer efficiency. Oxygen transfer efficiency in surface aerators at a given power level has been improved by innovative impeller design, larger impellers and lower speeds. However, aerators of this type have a higher capital costs than high speed aerators. Low speed surface aerators are the best choice for activated sludge systems. New concepts of tip speed and pumpong can be used to optimize the surface aerator design. Tip speed is only the tangential component of the mixed liquor discharge. Radial and vertical components must be added to the tip speed to determine the absolute discharge velocity from the blade. After design tip speed is chosen, the RPM and impeller size necessary to achieve the speed can be determined. It is advantageous to choose a large impeller diameter because of its higher pumping capacity. Mixing theory requires about five turnovers of a homogeneous fluid for complete mixing within the aeration zone. VLS surface aerators can achieve turnover in 6-10 min, for the same power, and increase actual oxygen transfer efficiency. The larger gear reducer and impeller required for VLS surface aerators increases the capital cost. However, the annual power cost savings effected by VLS aerators can offset the increased capital cost well within the usual industrial amortization time of three to five years. (Orr-FIRL)
W76-01552

WE MUST IMPROVE CHLORINATION DESIGN,
MCA Engineering Corp., Baltimore, Md.
C. M. Robson, B. S. Hyatt, Jr., and S. K. Banerji.
Water and Wastes Engineering, Vol 12, No 9, p 61-66, 68, September, 1975.

Descriptors: *Waste water treatment, *Disinfection, *Chlorination, Chlorine, Mixing, Analytical techniques, Measuring, Equipment, Design.

More stringent standards for the disinfection of waste water necessitates the improvement of chlorination practices. Recent standards concerned with virus inactivation call for free residual chlorine levels after one hour of 0.5 mg/liter to 3.0 mg/liter. The most commonly used method of measuring residual chlorine is the orthotolidine method. The amperometric titration method, based on an oxidation reduction procedure, is becoming more commonly used for waste water. Factors affecting the efficiency of the disinfection process include the quality of the influent to the disinfection process, temperature, pH, turbidity, and the presence of materials which exert a chlorine demand. The most important parameters in chlorination are rapid initial mixing, adequate contact time, and a workable automatic chlorine residual control system. Mixing in a chlorine system must be rapid; the ideal mixing time is a fraction of a second. An equation to predict the efficiency of chlorine disinfection is discussed, and a means of statistically analyzing the data from dye testing of contact chambers is illustrated. The most significant factor in the configuration of a chlorine contact chamber has been analyzed to be the length-to-width ratio. Current research on the effects of chlorine residuals on the aquatic environment has demonstrated the need for dechlorination. Sulfur dioxide, sodium bisulfite, sodium sulfite, sodium metabisulfite, and granular activated carbon can be used for dechlorination. (Orr-FIRL)
W76-01554

FUNDAMENTALS OF ELIMINATING ORGANIC WATER POLLUTANTS WITH POLYETHYLENE (GRUNDLAGEN DER ELIMINIERUNG ORGANISCHER WASSERBELASTUNGSSTOFFE MIT POLYAETHYLEN),
L. Weil, and G. Greiner.
Vom Wasser, Vol 43, p 247-257, 1974. 2 fig, 5 tab, 10ref.

Descriptors: *Organic compounds, *Flocculation, *Oil, *Waste water treatment, *Polymers, Polyelectrolytes, Potable water, Adsorption, Laboratory tests.

Waste water samples containing organic pollutants were treated on a laboratory scale to produce potable water in a flocculation plant with an hourly throughput of 400 cu m. Similar treatment was given to slightly polluted groundwater and bank-filtered river water for comparison. Polymer substances were added to the organic compounds before flocculation; these polymers were an emulsifier-free dispersion of a copolymer of ethylene and vinyl acylamide. Because the disperse plastic had a particle size of only 0.5 micrometers, short contact times were possible. Results indicated that lipophilic organic compounds (such as chlorinated insecticides, petroleum spirit, and crude oil) were removed far more efficiently from the waste water with polyethylene powder than with conventional chemical treatment methods. The addition of the polymer can be implemented in existing treatment facilities without adding further processing stages. Possibilities of applications and economics of the method are discussed. (Kramer-FIRL)
W76-01555

MOTIONLESS MIXERS IMPROVE OXYGEN TRANSFER EFFICIENCIES, PART I,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
K. H. Hsu, L. E. Erickson, and L. Fan.
Water and Sewage Works, Vol 122, No. 8, p 76-79, August, 1975. 6 fig.

Descriptors: *Chemical oxygen demand, *Activated sludge, *Biological treatment, *Waste water treatment, *Mixing, Equipment, Microorganisms.
Identifiers: *Oxygen transfer, Motionless mixers, Koch mixer.

Effects of various types of motionless mixers on oxygen transfer efficiencies are discussed. A multistage cocurrent sieve tray tower system and a cocurrent column packed with Koch mixers were studied. The multi-stage tower type activated sludge process was more efficient than any other known activated sludge process. A bubble column and a six-stage perforated plate column were applied to activated sludge treatment. Sludge in the bubble column caused bulking while sludge from the six-stage perforated plate column had good settling properties. The Koch mixer column removed COD as efficiently as the sieve tray column. Both mixers experienced wall growth by the organisms. (Pinto-FIRL)
W76-01556

UPGRADING HIGHWAY SERVICE AREA WASTEWATER TREATMENT PLANTS,
I. P. Sander.
Public Works, Vol 106, No 10, p 70-72, October, 1975. 1 fig.

Descriptors: *Waste water treatment, *Water supply, *Treatment facilities, *Sewage treatment, Flow rates, Clarification, Chlorine, Standards, Highways, New York.
Identifiers: Highway service, facilities.

Waste water treatment plants and center supply sources operated at highway service areas by the new York State Thruway Authority are discussed. Of 28 service facilities now in use, 27 are served by 24 Authority-owned waste water treatment plants. In 1964, with the aid of a counsulting firm, the water and waste water facilities were surveyed and recommendations for modifications were made. During the past ten years, five primary waste water treatment plants were converted to secondary treatment and others have been enlarged and improved. The Malden area about two hours from Metropolitan New York has encountered an unanticipated increase in peak daily flow. While the 1964 survey predicted a peak flow of 47,000 gpd, by 1972 the flow rate for 24 hours was 86,000 gallons. The plant was therefore redesigned, placing an aerated holding tank in the flow scheme following communition. This allowed a constant flow to be maintained in the primary clarifier so that the unit could function most efficiently. A plastic media packed bed reactor was later added and results were very satisfactory. Treatment plants along the Thruway are generally manned by a single operator, and chlorine handling was made relatively safer by the use of small chlorine containers of about 40 pounds. The summer partonage of the service areas is higher than in the winter and the chlorine containers must be changed more frequently. For each waste water treatment facility, the Authority has National Pollution Discharge Elimination Permits (NPDES) and the update or upgrading of the facilities will be conducted in order to comply with discharge standards. (Kramer-FIRL)
W76-01559

PRECAST CONCRETE PILES CUT PLANT CONSTRUCTION COST,
Onondaga County Dept. of Drainage and Sanitation, N.Y.
For primary bibliographic entry see Field 8F.
W76-01560

WHAT'S NEW IN WATER TREATMENT.
For primary bibliographic entry see Field 5F.
W76-01561

NITRATE REMOVAL BY ANION-EXCHANGE RESINS,
Environmental Protection Agency, Cincinnati, Ohio, Water Supply Research Lab.
R. W. Buelow, J. W. Kropp, J. Winthered, and J. M. Symons.
Journal of the American Water Works Association, Vol 67, No 9, p 528-534, September, 1975. 3 fig, 9 tab, 11 ref.

Descriptors: *Nitrates, *Anion exchange, *Ion exchange, Potable water, *Waste water treatment, Pollutant identification, Economic feasibility, Resins, Selectivity, Chemical analysis, Water pollution treatment, Chemical precipitation, Water treatment, Groundwater, Iron, Sulfates, Coasts.
Identifiers: *Nitrate selective resin, Nitrate removal.

High concentrations of nitrate in drinking water obtained from groundwater can cause serious illness or death. An ion exchange process has been developed using a nitrate selective resin which can remove low concentrations of nitrate. A laboratory study was conducted: to test the selectivity ot the resin; to test the performance of the resin when there are high concentrations of nitrate and other anions; to determine the influence of specific ions on resin performance; and to determine the economic feasibility of the process. Other ions used in the study were bicarbonate, silica, chloride, sulfate and iron. In small concentrations the resin shows a preference towards exchange of nitrate over sulphate and other ions, but at higher concentrations, the resin shows a preference for sulfate. In both hard and soft well water, nitrogen removal by the resin was decreased to 25.5% of base capacity. Iron precipitated and caused a fouling problem in the exchange. In studying the influence of specific ions on nitrate removal, it was found that silica reduced nitrate removal to 67.5% of base capacity, sulfate reduced it to 40 to 43.6%, sulfate plus alkalinity reduced it to 33.3%, and sulfate plus alkalinity plus chloride reduced it to 28.2%. Regeneration of the resin in the water was made possible by the addition of sodium chloride. This process becomes more feasible around a coastal area where there is an abundance of salt water. The cost of nitrate removal varies considerably with the quality of water, based mainly on the salt requirement. (Pinto-FIRL)
W76-01562

CONTRACTOR TEAMS TOUCH ALL BASES BUILDING WATER-SIDE SEWAGE FACILITY,
McGraw-Hill World News, San Francisco, Calif.
M. R. Drossel.
Construction Methods and Equipment, Vol 57, No 9, p 40-43, September, 1975.

Descriptors: Construction materials, Treatment facilities, Construction costs, Grouting, Oxygenation, Sludge digestion, Waste water treatment, California.
Identifiers: Oakland(Calif), Laser alignment, Hydraulic hoist, Scaffolding.

Work on the Oakland, California, East Bay Municipal District sewage treatment plant is discussed. The project cost $56 million. Cost saving aspects included concrete conveying and gangforming for a dozen settling tanks, compartmentalized oxygenation tanks and four sludge digester tanks; tank-riding, self-propelled scaffolds; an outfall pipe submerging and placing system featuring a hydraulic hoist, laser alignment and force-fed rock bedding; and specially grouted and doweled piling. Three settling tanks were built at a time, each one taking 16 days to complete. The four sludge tanks were built in 10 weeks. Laser alignment of a 624 ft addition to an eight foot diameter outfall piping permitted work to proceed in the fog and in the murky waters of Oakland Bay. A premixed non-metallic grout for the securing of the dowells at the tops of the piles was also used to cut installation costs. (Pinto-FIRL)
W76-01563

THE DEVELOPMENT OF A CENTER PIVOT WASTEWATER IRRIGATION MACHINE,
Metropolitan Sanitary District of Greater Chicago. Ill.
G. W. Hall.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. 5 fig, 2 tab, 7 ref.

Descriptors: *Sprinkler irrigation, *Waste water disposal, Application methods, Application equipment, *Irrigation practices, Irrigation water, Irrigation, Irrigation systems.
Identifiers: *Center pivot irrigation machine.

The center pivot irrigation industry continues to improve its product each year. Problem areas highlighted by a testing program were corrected and incorporated into the manufacturers model changes for the next year. Probably the most important difference between a conventional center pivot irrigation machine and a wastewater center pivot irrigation machine is the spray bar concept. The low operating pressure requirement provides a lower operating cost because of lower pumping costs. However, the high instantaneous application rate of the spray bar concept limits its application to areas where the soil has a high intake rate if surface runoff is minimized. The center pivot wastewater irrigation machine will continue to be a modified conventional center pivot irrigation machine until the wastewater market developes to the point where the center pivot industry begins to conduct research and development programs. The goal of the wastewater industry and the agricultural industry is the same and that is to have a economical, dependable irrigation machine. (Skogerboe-Colorado State)
W76-01565

STATE OF THE ART--ACID MINE DRAINAGE CONTROL,
Consolidated Coal Co., Library, Pa.
For primary bibliographic entry see Field 5G.
W76-01625

A LOW COST WASTE TREATMENT METHOD FOR THE DISPOSAL OF DISTILLERY WASTE (SPENT WASH),
Walchand Coll. of Engineering, Sangli (India).
B. S. Rao.
Water Research, Vol 6, No 11, p 1275-1282, 1972. 4 fig, 3 tab, 9 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Sewage lagoons, *Waste water disposal, Pilot plants, Biochemical oxygen demand, Chemical oxygen demand, Organic loading, Fertilizers, Asia, Hydrogen ion concentration, Irrigation, Potassium, Costs.
Identifiers: *Distillery wastes, Volatile solids, India.

Experimental studies in India indicate that distillery wastes can be treated in open anaerobic lagoons. An organic loading of 0.604 kg BOD/cu m/day is optimum for a BOD removal efficiency of 90-95% and volatile solids reduction of 78%. When anaerobic lagoon treatment is followed by another lagoon, BOD can be reduced to 600 mg/l. COD was 1.38 times the total volatile solids concentration for raw spent wash and 1.54 times that for lagoon effluent. Lagoons can operate at a volatile acid accumulation of 21,000 mg/l but above pH 6.5 the efficiency is lowered. Sulfate concentrations of 5000 mg/l did not affect performance. Effluents contained 300-500 mg sulfate/l. Anaerobic lagoon effluent diluted 1:10 with fresh water was used to irrigate sugar cane; the deleterious effects of about 5000 kg potassium/ha accumulation in the soil in one year are unknown. No deleterious effects were observed on the soil, crop, pH, conductivity, and cation exchange. Lagoon depth can vary between 0.9-3.0 m, but a 1.8 depth showed better performance. The largest distillery in India is now treating their entire spent wash (800,000 l/day) in lagoons. The COD and BOD of the effluent from the last lagoon is 5000 an 1800 mg/l, respectively. (Buchanan-Davidson--Wisconsin)
W76-01626

TREATING DYE WASTEWATER,
Cone Mills Corp., Greensboro, N.C.
T. A. Alspaugh.
Textile Chemist and Colorist, Vol 5, No 11, p 255-260, 1973. 9 tab, 15 ref.

Descriptors: *Dyes, *Waste water treatment, *Industrial wastes, *Textiles, Biochemical oxygen demand, Chemical oxygen demand, Biological treatment, Color, Suspended solids, Colloids, Sludge treatment, Reverse osmosis, Operating costs, Chemical precipitation, Filtration, Nutrient removal, Irradiation, Activated sludge, Oxidation lagoons, Recycling, Pilot plants.
Identifiers: *Textile dye removal.

Water management and waste disposal problems of the textile industry are reviewed. There is no simple, economical treatment method. Biological treatment is the most economical, provides good biochemical oxygen demand removal, but does not remove enough color, chemical oxygen demand, suspended solids, and nutrients to be used alone. Growth of filamentous organisms cause poor settleability. Use of reverse osmosis or adsorptive resins for dissolved organic and color removal must be preceded by chemical flocculation, sedimentation, or filtration, otherwise they are impractical. Success of carbon adsorption depends on dyes used and colloidal nature of the liquid to be filtered; chemical pretreatment or sedimentation may be required. Hyperfiltration of effluents is promising if cost can be competitive. Gamma radiation to degrade refractory dye colors plus concentration of the organic fraction with an adsorbent prior to irradiation are possible. The most practical approach includes reducing water use; reusing relatively clean water; economic study of chemical recycling; development of recycleable chemicals; replacement of toxic dye substances; use of biodegradable compounds; and study of steps directed toward elimination of non-biodegradable colors. Today biological treatment is the best choice, possibly in combination with chemical coagulation. (Buchanan-Davidson--Wisnconsin)
W76-01629

CONSERVING OUR RESOURCES--THE CONTRIBUTION OF CHEMICAL TECHNOLOGY,
For primary bibliographic entry see Field 3E.
W76-01630

A SURVEY OF WASTEWATER TREATMENT TECHNIQUES FOR STEEL MILL EFFLUENTS,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
T. J. Centi.
In: 'The Steel Industry and the Environment,' Proceedings of the 2nd Furnas Memorial Conference, p 169-198, 1973. 5 fig.

Descriptors: *Metalurgy, *Steel, *Effluents, *Waste water treatment, Mills, Water utilization, Iron, Suspended solids, Surveys, Oil wastes, Acids, Liquid wastes, Chemical wastes, Metals, Recirculated water, Gases, Air pollution.
Identifiers: Coke.

Water pollution problems in the steel industry involve size of operation, large water volumes, variety of products, and age of the industry. About 30-40,000 gallons water are used per ton finished steel. Manufacturing process techniques used by most of the industry are described, divided into coke manufacturing (beehive coke making, byproduct coke manufacture); iron manufacturing (blash furnace, cupola); steel manufacturing (basic oxygen furnace, open hearth, electric furnace, continuous casting, vacuum degassing); hot forming (blooming, slabbing, bar, hot strip, structural, billet, plate, seamless pipe, rod, and buttweld pipe mills); and cold finishing (batch pickling; continuous pickling; cold rolling; electric weld pipe, screw and nut, and nail mills; cold degassing); tin plating; and coating and galvanizing). Waste water characteristics from each are discussed, effluent parameters described, and methods of handling effluents discussed. Principal wastes are suspended solids, oils, acids, soluble metals, and coke plant materials. Treatment methods and efficiency vary with source, volume, and combination of wastes. Some companies provide a well-defined single treatment scheme for total plant effluents. Recirculating and reuse techniques deserve more attention. Waste treatment methods must be carefully planned and monitored. (Buchanan-Davidson--Wisconsin)
W76-01631

SCIENTIFIC SYMPOSIUM ON DAIRY EFFLUENT TREATMENT,
J. S. Cooper, and L. Royal.
The Milk Industry (U.K.), p 25-27, October 1973.

Descriptors: *Conferences, *Dairy industry, *Waste water treatment, Pollution abatement, Byproducts, Analytical techniques, Chemical oxygen demand, Bacteria, Pathogenic bacteria, Water reuse, Trickling filters, Chemical precipitation, Biological treatment, Europe, Sprinkler irrigation, Oxidation lagoons, Biochemical oxygen demand, Economics.
Identifiers: *Denmark, Product recovery.

A symposium organized by the Danish Government Research Institute for the Dairy Industry under the auspices of the Danish Natioanl Committee of the International Dairy Federation was held in 1973. Delegates from many countries presented papers discussing aspects of dairy effluents such as control of waste materials, sampling, analysis, public health, and chemical and biological treatment methods. The conclusions were that an International Dairy Federation group on the subject of dairy effluent treatment should be formed to study control of losses, waste prevention methods, water reuse, sampling, analytical methods, treatment plant economics, sludge disposal, and spray irrigation. Waste prevention and surveys of effluent sources received less attention than treatment processes. Extended aeration plants in the form of oxidation ditches are used on the European continent. Germany had studied high rate filtration with plastic media before use of oxidation ditches. Except for Holland, standards for discharges to water courses were less severe than the United Kingdom Royal Commission Standards and involved only a biochemical oxygen demand requirement which demanded less capital expenditure and operational control. Sludge disposal was given little attention. (Buchanan-Davidson--Wisconsin)
W76-01632

THE TREATMENT OF BLAST FURNACE GAS WASHING EFFLUENT,
British Steel Corp., Wolverhampton (England). Bilston Works.
R. T. Myatt, R. J. Aston, and K. S. Johnson.
Iron and Steel International, Vol 46, No 5, p 421-424, 1973. 3 fig, 3 tab.

Descriptors: *Steel, *Cooling water, *Waste water treatment, *Industrial wastes, Treatment facilities, Design, Pilot plants, Costs, Standards, Carbonates, Dissolved solids, Zinc, Hydrogen ion concentration, Lime, Activated sludge, Chlorine, Oil wastes, Toxins, Phenols, Ammonia, Biochemical oxygen demand.
Identifiers: *Blast furnace cooling towers, *British Steel Corp.(England), Cyanide.

The Bilston Works of Special Steels Division, British Steel Corporation, converted the blast furnace gas washing effluent system to a recirculating system, with sufficient bleed-off to prevent excessive build-up of dissolved solids and problems arising from carbonate scale deposit in pumps, pipework, and cooling tower. Optimum bleed-off volume was about 10,000 gallons/hour. At this rate, the dissolved solids content was 1500-2000 ppm with no marked increase in cyanide and zinc. Pilot plant tests in which pH control with lime was followed by an activated sludge process resulted in variations in cyanide and zinc concentrations over short periods. Chlorine oxidation under alkaline conditions of effluents containing cyanides appeared feasible. Plans for the treatment plant had two phases: first, removal of oil, cyanides, and toxic metals and adjustment of pH by physicochemical treatment; and secondly, removal of phenols, ammonia, and reduction of biochemical oxygen demand by biological oxidation techniques to limits set by the Trent River Authority. The first stage has been operational for one year. The average reagent cost per million gallons effluent was 82.30 British pounds. The second stage plant is being designed to use first stage effluents as feed liquors to produce discharges that meet water quality standards. The plant is described. (Buchanan-Davidson--Wisconsin)
W76-01633

TERTIARY TREATMENT OF PROCESS WATER,
American Oil Co., Whiting, Ind.
A. E. Franzen, V. G. Skogan, and J. F. Grutsch.
Chemical Engineering Progress, Vol 68, No 8, p 65-72, 1972. 7 fig, 9 tab, 5 ref.

Descriptors: *Tertiary treatment, *Waste water treatment, Industrial wastes, Indiana, Oil wastes, Chemical wastes, Coagulation, Flotation, Nutrient removal, Design, Hydrogen ion concentration, Pilot plants.
Identifiers: American Oil Co., Whiting(Ind), Alum.

The waste water stream from the American Oil Company refinery at Whiting, Indiana, required extensive treatment before discharge into Lake Michigan. Three stages of treatment are now in effect. The final step, tertiary treatment by chemical coagulation and air flotation, has been in operation more than a year and is an effective method for removal of contaminants. A second stage treatment called Bio-Flotation, incorporates a series of bio-flotation ponds where biological oxidation, sedimentation, and flotation of biological solids and contaminants occur. Chemical treatment with alum and polyelectrolytes is used to coagulate residual contaminants. Phase separation was accomplished by air flotation. The effluent has a better appearance and phosphates are removed in the final step. Air flotation causes further improvements in biochemical oxygen demand, total oxygen demand, threshold odor number, pH, turbidity, phenolics, oil, and suspended solids. The driest scum is probably produced when skimmers are operated at a speed no greater than that required to keep up with scum production. The design parameters for the air flotation system and performance of the tertiary treatment facilities are given. (Buchanan-Davidson--Wisconsin)
W76-01634

RECOVERY OF MATERIALS FROM THE WASTEWATER FROM WINE DISTILLERIES BY DRYING THE MIXTURE OF SOLID AND LIQUID WASTES,
Water Supplies of Languedoc-Roussilon (France). Regional Board of Management.
G. Ducellier.
Water Research, Vol 7, No 4, p 595-598, 1973. 9 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Drying, *Byproducts, Solid wastes, Liquid wastes, Europe, Fertilizers, Feeds, Nutrients.
Identifiers: *Wine distilleries, *Wine dregs.

Undiluted wine distillery waste has a biochemical oxygen demand above 100,000. Until recently effluents of wine dregs distillation were discharged into lagoons or water. Spent wine is more difficult to purify than domestic sewage. After chemical and biological treatment, diluted spent wine still has a BOD of 600-3000. During biological treat-

ment, degradation rates vary according to size and complexity of the molecules. Purification frequently decelerates with high loads consequently waste water must be diluted by recycling purified effluent. Reclaiming fertilizer or cattle feed from wine dregs may be more economical than treatment. When mould and distilled dregs were dried in an oven and the open air or completely dried in the open air, the product could be stored for one year and used as sheep feed. The least costly method was to prepare fertilizer by pre-drying in the open air to 65% water content then oven drying to 50% water content. Nitrogen, phosphorus, and potassium were not changed by drying. The dried mixture contained an average of 3.3% nitrogen, 1% phosphorus, and 1.5% potassium. (Buchanan-Davidson--Wisconsin)
W76-01635

SOME EFFECTS OF METALS DISCHARGED IN EFFLUENTS AND POSSIBILITIES FOR THEIR RECOVERY,
Water Pollution Research Lab. Stevenage (England).
J. D. Swanwick, and J. V. O'Gorman.
Chemistry and Industry (G.B.), p 537-540, June 16, 1973. 29 ref.

Descriptors: *Metals, *Sewage, *Reclamation, Effluents, Europe, Zinc, Copper, Nickel, Chromium, Sewage disposal, Chemical precipitation, Anaerobic digestion, Industrial wastes, Sewage sludge, Cadmium, Lead, Toxicity, Electrophoresis, Electrodes, Heavy metals, Recycling, Ion exchange, Reverse osmosis, Activated carbon, Adsorption, Polyelectrolytes.
Identifiers: England.

Metals may be removed from sewage as hydroxides, basic carbonates, or sulfides, depending on metal ion concentration and pH. More zinc, copper, and nickel were removed in activated-sludge than primary sludge. Nitrified effluents removed more copper, nickel, zinc, or chromium. Anaerobic sludge digestion increased the values of industrial and domestic sludge contents of copper, nickel, zinc, chromium, cadmium, and lead. The relative toxicities of nickel, copper, and zinc to plants were 8:2:1, and digested sludge could be safely applied to crops but metals in dewatered sludge cake approached dangerous levels. Heavy metals inhibited anaerobic digestion, but sodium sulfide or cadmium acetate eliminated the inhibition. A silver:silver electrode can be used to monitor soluble sulfides and detect heavy metals built up in sludge. Metals can be recovered by recycling metals and water or by precipitation from effluents and recovering from sludge. Metals can be concentrated by incinerating sludge or treating effluents with lime. Hydrometallurgical recovery processes are more flexible, economical, and cause less pollution than thermal processes. Metals can be recovered from sludge by dissolving in acid, and separating by integrated treatment systems, solvent extraction, ion exchange, reverse osmosis, electrochemical methods, activated carbon adsorption, or formation of complexes with polyelectrolytes. (Buchanan-Davidson--Wisconsin)
W76-01639

WASTE TREATMENT FOR THE PABST BREWERY AT PERRY, GEORGIA,
Wiedeman and Singleton, Atlanta, Ga.
T. R. McWhorter, and R. J. Zielinski.
In: Proceedings 26th Industrial Waste Conference, Part 2, Extension Series No. 140, p 604-612, 1971. 2 fig, 5 tab.

Descriptors: *Treatment facilities, *Design, *Waste treatment, *Industrial wastes, *Georgia, Fluctuations, Biochemical oxygen demand, Suspended solids, Sludge disposal, Sprinkler irrigation, Effluents, Automation, Flow rates, Chemical oxygen demand.
Identifiers: *Breweries, Pabst Brewery, Perry(Ga), Big Indian Creek(Ga).

Big Indian Creek, an unpolluted stream high in dissolved oxygen and low in biochemical oxygen demand, solids, hardness, and coliforms, was the receiving stream for treated brewery effluent. Major sources of waste were spent grain press liquor, decant from filter decant tanks, yeast remaining after yeast recovery, spillage, cleaning rinses, and caustic cleaning solution dumps. Variations in flow volume, biochemical oxygen demand, dissolved solids, pH, and temperature were large. The plant was designed to treat 7500 bbl waste/day. Waste was collected in seven systems as uncontaminated cooling water, cooling tower blow down, sanitary sewage, diatomite filter backwash, spent caustic cleaning solution, high strength process waste, and other process wastes. The anticipated waste loads and limited stream assimilation capacity required removal of 97% biochemical oxygen demand and 95% suspended solids. The treatment process was multi-stage with coarse screen, grit chamber, primary clarifiers, plastic media trickling filters, activated sludge basins, final clarifiers, effluent polishing lagoon, aerobic sludge disgestion basins, sludge lagoons, and sludge sprays. Raw waste flow averages one million gallons/day. Average monthly chemical oxygen demand removal is 95-97%. The biochemical oxygen demand/chemical oxygen demand ratio decreases throughout treatment. Effluent quality has been very stable. (Buchanan-Davidson--Wisconsin)
W76-01640

LIMESTONE TREATMENT OF RINSE WATERS FROM HYDROCHLORIC ACID PICKLING OF STEEL,
Armco Environmental Engineering, Middletown, Ohio.
J. E. Barker, S. F. Melzer, and R. D. Snook.
In: Proceedings of the 26th Industrial Waste Conference, Part 2, May 4-6, 1971, Purdue University, Lafayetts, Indiana, p 49-53.

Descriptors: *Limestone, *Acidic water, *Waste water treatment, *Steel, Iron oxides, Oxidation, Operating costs, Neutralization, Aeration, Sludge treatment, Filtration, Waste disposal, Treatment facilities, Design, Capital costs, *Ohio.
Identifiers: *Steel pickling water, Ferrous hydroxide sludge, Middleton(Ohio).

Ferrous metals develop oxide coatings during manufacture, which are removed from low carbon steels by acid pickling and rinsing with water, forming spent pickling acid and rinse water. Armco Steel Corporation's Middleton, Ohio Works could handle spent pickling acid, but not acid rinse water. An economical hydrochloric acid rinse water treatment, was developed utilizing limestone neutralization, aeration, and sludge recurculation to oxidize ferrous iron and produce filterable precipitates. Pilot studies indicated that higher temperatures resulted in higher system capacities and filtration rates. At each temperature there was a minimum pH, below which ferrous iron oxidation was incomplete. Since acid rinse water flow at the treatment plant was half that expected, retention times were approximately doubled. Increased aeration tank retention time probably accounted for success in treating waste at lower temperatures. Total effluent iron concentration was less than 5 mg/1, turbidity was low, and pH 6.8-7.1. Sludge was easily dewatered and handled. The lagoon was successfully stocked with fish. One man can handle the treatment facility. At a waste volume of 900 gpm and total acid concentration of 500 mg/1, operating costs, excluding supervision and sludge disposal were $0.24/1000 gal acid rinse water. (Buchanan-Davidson--Wisconsin)
W76-01641

REMOVAL OF ZINC FROM PLATING RINSE WATER BY SIMPLE NEUTRALIZATION,
Dittmann (Carl) and Co., Karlsruhe (West Germany).
M. Rodenkirchen.
Plating, p 698-700, July 1973. 1 fig, 3 ref.

Descriptors: *Waste water treatment, *Zinc, *Neutralization, Separation techniques, Ammonium compounds.
Identifiers: *Plating rinse waters, Sodium hydroxide.

A new leveling bright zinc chloride plating process using a weak acid, high-performance zinc plating electrode was studied to determine if zinc could be separated from zinc-containing rinse water. The procedure is economical and easy to control and maintain. Zinc removal from water rinses following this procedure was studied. Rinse water zinc concentration depended on cycle time, surface area and contour of the part, zinc concentration of the plating bath, etc. High zinc concentrations indicated that the rinsing procedure was faulty. Insufficient rinsing causes white spots on the zinc surface. Rinse water samples were diluted and neutralized at pH 8.6. Ammonium ions complexed hydroxyl ions up to about 0.45 g zinc/1. In rinse water containing 200 mg zinc/1 maximum, zinc was quantitatively precipitated. The upper permissible limit was 450 mg zinc/1. Zinc did not form stable complexes at pH 8.6, so there was no interference with NaOH precipitation. The zinc content of the supernatant rinse water after the precipitate had settled was within legal effluent limits (3 mg/1); special treatment was not required. (Buchanan-Davidson--Wisconsin)
W76-01642

KINETICS OF LIMESTONE DISSOLUTION BY ACID WASTE WATERS,
Pennsylvania State Univ., University Park. Mineral Processing Section.
T. H. Wentzler, and F. F. Aplan.
In: 'Environmental Control,' C. Rampacek, editor. Proceedings of Symposium 101st Annual Meeting American Institute of Mining Engineers, February 20-24, 1972, San Francisco, California, p 513-523. 4 fig, 14 ref.

Descriptors: *Waste water treatment, *Acidic water, *Neutralization, *Limestones, Industrial wastes, Kinetics, Sludge, Sulfates, Hydrogen ion concentration.

The problem of neutralizing acidic solutions is similar to the treatment of coal mine drainage, spent steel pickling liquiors, inorganic acid chemical plant wastes, and copper mine dump leaching. These investigations indicated that dissolution of limestone in acidic solution is a transport controlled, a first order reaction with respect to hydrogen ion; the dissolution rate thus decreases one order of magnitude for each unit of increase in pH. It is possible to spall off gypsum and thick iron hydroxide coatings by stirring (ca. 1700 rpm). At that rotational speed, gypsum neither precipates on the surface nor inhibits the reaction rate. Ferric hydroxy complexes adsorb onto the limestone surface whereas ferric ion and iron hydroxide do not. Neither gypsum coatings nor iron hydroxide coatings significantly inhibit the limestone dissolution rate below pH 2 and pH 3. Only between ca. pH 2-3, where iron hydroxy complexes predominate, are coatings formed that substantially reduce the limestone dissolution rate. In addition to acid mine drainage neutralization by limestone, this work emphasizes the critical role ion concentration, and particularly pH, plays in the formation of adsorbable metal ion hydroxy complexes and in inhibiting coatings and precipitates wherever acidic solutions are neutralized. (Auen-Wisconsin).
W76-01643

EFFLUENT: THE FUTURE WATER SUPPLY,
M. W. Askew.
The Milk Industry (U.K.), Vol 73, No 5, p 32-40, 1973. 4 fig, 3 tab.

Descriptors: *Dairy industry, *Waste disposal, *Water demand, Costs, Recycling, Optimization, Waste water treatment, Water conservation, Water costs, Water reuse, Water utilization, Water values, Europe, Effluents.
Identifiers: *Milk wastes, England, Wales.

Existing use of water in England and Wales (in excess of 5000 mgd) represents practically the whole of the readily available resources of good quality water and increased supplies will depend heavily upon direct and indirect recycling. To protect the total resources increasingly stringent controls will be placed upon the quality of effluents discharged to watercourses. It is therefore inevitable that the costs to industry of both water supply and effluent disposal will continue to rise. Considerable reduction in water demand and effluent volume can be achieved by simple procedures. Milk processing wastes are typically easy to degrade biologically and thus to purify in biological treatment systems. Multiple-use can minimize the total volumes of water employed in, and the quantities of effluent produced by a production unit as well as by reclamation and direct reuse. For economic reasons on-site effluent treatment will become the norm in the milk-processing industries and water recovery and reuse will become a common corollary. It is essential in planning and designing a system to deal with production and water management needs cohesively as a function of the water quality requirements of unit production operations, and of the future costs of new and reclaimed water. (Auen-Wisconsin)
W76-01644

WATER QUALITY ASPECTS OF TANNERY EFFLUENTS DISPOSAL,
National Research Inst. for Shoe and Allied Industries, Gottwaldov (Czechoslovakia).
J. Ludvik, A. Orlita, S. Siska, K. Jansky, and J. Bohm.
Journal American Leather Chemical Association, Vol 68, No 7, p 283-295, 1973. 1 fig, 4 tab, 6 ref.

Descriptors: *Tannery wastes, *Waste water treatment, *Waste disposal, Europe, Industrial wastes, Water pollution effects, Organoleptic properties, Foaming, Toxins, Lethal limit, Bacteria, Pollution abatement, Effluents.
Identifiers: Czechoslovakia.

To meet the high water purity standards in Czechoslovakia tannery wastes are treated by mechanical and biological methods. Examples of technological flow-sheets of a mechanical and biological treatment plant for a factory producing chrome-tanned and vegetable-tanned leather are illustrated. The mechanically treated water is discharged either to a public sewage system for standard biological treatment or to the biological stage of a separate treatment plant. Treatment methods for high alkalinity, sulfides, chromium salts, and tanning agents residues are described. Formulae are given for the optimum method for establishing and controlling the activated sludge process. The biological treatment of tannery effluents by activated sludge meets the established requirements for disposal of these waste waters into a receiving water with due consideration for natural dilution. Sludge is dewatered in sludge beds to a dry content of 25% and can be readily transported and used directly as agricultural fertilizers. The chromium content of the sludge should not exceed 1000 kg/hectare. The potential of reducing the chromium in sludges and thus improving the fertilizer usage exist in the recovery of chromium from exhausted liquors. (Auen-Wisconsin)
W76-01645

WASTES FROM THE MALTING AND BREWING INDUSTRY,
J. F. Walker.
Water Pollution Manual, J. R. Fuller, editor. Thunderbird Enterprises, Ltd., Harrow, Middlesex, England, 1972, p 174-179. 13 tab, 10 ref.

Descriptors: *Industrial wastes, *Waste water treatment, Effluents, Organic matter, Biochemical oxygen demand, Activated sludge, Spraying, Waste water disposal.
Identifiers: *Brewing industry, *Malting industry, England.

The various processes of malting, the conversion of malt into beer, bottling, and cask washings disposal, all of which generate high BOD effluents, are discussed. Several methods of treating the effluents in small and large operations are described. One plant consists of a plastic filled biotower followed by a pair of conventional stone filled filters operating on an ADF cycle. It is handling 60,000 gpd at 2000 ppm BOD and has been shown to be capable of producing an effluent with 20 ppm suspended solids and 20 ppm BOD. There is an activated sludge system handling some 1650 lbs BOD per day, though some difficulty is encountered from filamentous growth and sludge bulking and it is necessary to supply both nitrogen and phosphorus. A full scale activated sludge plant in the form of Pasveer ditches was installed at a malting plant and is working successfully. A large scale experiment was tried where malting effluents were disposed by spraying on pasture land. Spent grains and spent hops may be removed as wet solids but in some breweries they are resuspended in water and pumped out as a slurry. Filters are usually powder or sheet types. (Auen-Wisconsin)
W76-01646

NEW WASTE WATER PRACTICES IN DAIRY PLANTS,
CREPACO, Inc., Chicago, Ill.
For primary bibliographic entry see Field 3E.
W76-01647

A FACILITY FOR THE BIOLOGICAL TREATMENT OF A COMPLEX CHLOROPHENOLIC WASTE,
Arkansas Univ. at Little Rock. Div of Life Sciences.
W. F. Evans.
Arkansas Academy of Science Proceedings, Vol 25, p 38-40, 1971. 1 fig, 7 ref. FWQA WPRD 246-01-68.

Descriptors: *Sewage treatment, *Biological treatment, *Herbicides, 2,4-D, 2,4,5-T, Industrial wastes, Arkansas, Aerated lagoons, Oxidation lagoons, Biochemical oxygen demand, Hydrogen ion concentration, Dissolved oxygen, Plankton, Coliforms, Equipment, Biodegradation.
Identifiers: *Jacksonville(Ark), Chlorophenols, Chlorophenoxy acids.

Industrial wastes entering the Jacksonville, Arkansas, sewage treatment facility contain chlorophenols and chlorophenoxy acids from the manufacture of the hormone-type herbicides, 2,4-D and 2,4,5-T. An aeration lagoon was built to aerate the total flow before release into two existing oxidation ponds. Because data collected during a preliminary survey and 12 months following completion of the aeration system had not been released, no firm conclusions on the efficiency of the system can be reached, but preliminary results indicate that the aeration lagoon removed 55 to 89% of the chlorophenols. Overall chlorophenol removal by the lagoon and stabilization ponds was 87 to 94%. Chlorophenoxy acid removal was 30 to 70% in the lagoon and 49 to 80% in the lagoon and oxidation ponds. During plant operation the average biochemical oxygen demand was 15 mg/l, chlorophenols 0.1 mg/l, and chlorophenoxy acids 1.1 mg/l. There was no significant change in pH, dissolved oxygen, or type and number of plankton one year after operation of the plant began. Reduction in the number of coliforms was good in the stabilization pond effluents; counts were high in the summer, low in winter, and intermediate in spring and fall. (Buchanan-Davidson--Wisconsin)
W76-01648

CASE HISTORY ON ACID MINE DRAINAGE CONTROL,
Bethlehem Steel Corp., Pa.
For primary bibliographic entry see Field 5G.
W76-01650

INDUSTRIAL WASTEWATER PUMPS,
Fluor Engineers and Constructors, Inc., Houston, Tex. Process Dept.
For primary bibliographic entry see Field 8C.
W76-01661

STUDIES ON ELECTROLYTIC TREATMENT OF WASTE WATER (I): REGENERATION OF PHOTOGRAPHIC BLEACH SOLUTION, (IN JAPANESE),
E. Torikai, H. Maeda, and Y. Kawami.
Osaka Kogyo Gijutsu Shikenjo Kiho, Vol 26, No 1, p 1-9, March, 1975. 10 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Electrolysis, Recycling.
Identifiers: Photographic processing wastes, Potentiostatic electrolysis, Ferricyanide bleach regeneration.

The regeneration of photographic ferricyanide bleaches using potentiostatic electrolysis was studied. The optimum conditions for the electrolysis include: an anodic potential of 0.5 to 0.7 V vs. SCE; a platinum coated titanium of graphite anode; a graphite or titanium cathode; a bleach solution anolyte; a catholyte of NaOH, KOH, NaBr, KBr in a one mol/liter solution; a ceramic or organic polymer membrane diaphragm; and, a temperature between 20 and 40 C. The current efficiency of the method was 98.5 to 99.8 percent. The sub-reaction of Br(-) to Br was controlled in the potentiostatic method which prevented the undesirable precipitation of Fe(OH)3. In the potential range of 0.5 to 0.7 V, the oxidation reaction of Fe(CN)6(4-) to Fe(CN)6(3-) in the bleach solution was considered as a mass transfer limited reaction. The cell current can be used to control the variation of the Fe(CN)6(4-) concentration in the electrolyte. (Orr-FIRL)
W76-01662

CLEANING UP THE RHINE.
Chemical Age, Vol 111, No 2932, p 20, September 26, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Treatment facilities, Sewage, Biochemical oxygen demand, Sedimentation, Settling basins, Sludge treatment, Incineration, Sludge disposal.

The BASF Ludwigshafen plant is the largest chemicals production site in Europe, producing nearly 6000 different products including about 2.1 million ton/year of fertilizers and the same amount of plastics. In 1964, the BASF began a ten year program to solve its emission problems, and to help clean up the Rhine river. The construction of an effluent treatment plant to handle the industrial wastes and sewage from the city of Ludwigshafen and part of the nearby area of Frankenthal was a major part of the plan. The new facilities will reduce the BOD loading of the waste water streams by at least 95 percent. The wastes are first screened to remove solids greater than 0.8 in. and then sent to four primary sedimentation basins. After activated sludge treatment, the water is passed to 10 secondary sedimentation basins. The sludge is settled for one day in one of five basins and then mixed with recycled ash and ferric chloride and dried in chamber filter presses. The resultant dried mixture with a residual moisture between 50 and 55 percent is then incinerated in fluidized bed furnaces. Future plans include two or more primary sedimentation basins, 10 more secondary sedimentation basins, and four extra sludge thickening basins. (Orr-FIRL)
W76-01663

POLYVINYL CHLORIDE-BASED FILTER MATERIAL,
V. P. Sokolov.
Soviet Patent SU 424581. Issued January 23, 1975.
Soviet Inventions Illustrated, Vol W, No 31, p D2, September 9, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Filtration, Plastics, Suspended solids, Polymers, *Patents.
Identifiers: *Polyvinyl chloride.

A patent has been issued for a polyvinyl chloride based filter material for waste water treatment. The efficiency of filtration of waste waters is improved by using the filter material consisting of finely dispersed PVC or its copolymer with vinyl acetate with an addition of 50-80 weight percent of $BaSO_4$ and 20-50 weight percent of the polymer or copolymer. The addition reduces the oxygen demand of the waste water by 45-50 percent and the turbidity by 20-22 times. The filtrate will contain 2-3 mg/liter of suspended and colloidal material. This method was used to treat an effluent from a PVC manufacturing process containing 640 mg/liter of suspended and colloidal polymer particles. This was filtered through a 30 mm layer containing 6 weight percent $BaSO_4$ and vinyl chloride, and 40 weight percent of acetate copolymer. The amount of the oxygen demand was reduced by 45 percent, the turbidity by 20 times, and the solid and colloidal particles to 3 mg/liter. (Orr-FIRL)
W76-01664

PLANNING WASTEWATER TREATMENT BY EXPANDABLE PARAMETER-WITHDRAWAL TECHNOLOGY,
Firestone Tire and Rubber Co., Akron, Ohio.
F. G. Troppe.
Pollution Engineering, Vol 7, No 9, p 65-66, September, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Planning.

An engineering analysis using an expandable parameter-withdrawal technology will help to optimize the cost/benefit/safety requirements of industrial water pollution control and abatement programs. A basic parameter-withdrawal model was employed at a synthetic rubber plant in Akron, Ohio. Each of the primary treatment techniques of waste blending and flow stabilization, bar screening for trash removal, chemical coagulation/flotation for suspended solids removal, pH adjustment, and oil removal were depicted as a series of building blocks performing only the minimum parameter-withdrawal necessary for discharge of the effluent to a municipal treatment plant. The model was utilized at another synthetic rubber plant which required more extensive treatment because the discharged effluent goes directly to a high-quality stream. More consideration must be given to total recycle of a plant's waste water in order for treatment to remain economically competitive. This building block approach is valuable to the pollution engineer in the preliminary planning of new facilities. The approach allows the quick identification and inclusion of major cost items. (Orr-FIRL)
W76-01665

ROTARY DRUM VACUUM FILTRATION FOR CHEMICAL/BIOLOGICAL SLUDGE,
Lubrizol Corp., Deer Park, Tex.
C. W. Brabston.
Filtration Engineering, Vol 6, No 4, p 12-13, 16, May/June, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Filtration, Sludge treatment, Biological treatment, Dewatering, Lime.
Identifiers: *Rotary drum vacuum filtration.

The waste water from the Lubrizo Corporation's plant in Deer Park, Texas, which produces chemical additives for petroleum products, is treated in a one million gpd treatment plant. Treatment consists of oil separation, equalization, neutralization, aerated lagoon treatment, and final sedimentation. The chemical and biological sludges are thickened prior to combining them for dewatering by rotary drum vacuum filtration. Vacuum filtration was chosen after a series of field tests were performed. The filters selected were eight-foot in diameter by 10 ft length, 250 sq ft Ametek units equipped with 30 hp vacuum pumps. Initial problems with the filter cloth selected were corrected when a polyester cloth (70 x 120 threads per inch) was chosen. Experimentation was performed with various combinations of feeds to find the best combinations for the production of a maximum cake yield at a minimum expense. The best combination was found to be approximately five to eight percent solids for the chemical sludge, and three to five percent solids for the biological sludge. The sludges are combined at a three to one, chemical to biological ratio, conditioned with 100-150 percent lime, and then filtered. The rate of feed varies between 50 and 60 gal/min. The final cake is about 28-35 percent solids. Filter cleaning is accomplished by rotating low pH water from the plant in the vacuum filters for about eight hours. A continuing research program is being conducted at the plant to determine the factors that can be varied and the modes of operations that can be run, in order to have some idea of what to do when new problems occur. (Orr-FIRL)
W76-01666

OZONATION OF PHOTOGRAPHIC PROCESSING WASTES,
Eastman Kodak Co., Rochester, N.Y.
R. W. Bober, and R. J. Dagon.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2114-2129, August, 1975. 11 fig, 3 tab, 14 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Ozone, Biochemical oxygen demand, Chemical oxygen demand, Tertiary treatment, Biological treatment, Biodegradation.
Identifiers: *Photographic processing wastes.

The use of ozone to degrade certain refractory organic wastes and to reduce the BOD and COD of photographic processing wastes has been studied. Various chemicals found in processing solutions were ozonated, individually and collectively, in order to determine whether ozone could be used as a practical combined tertiary treatment after biological treatment of these wastes or whether it would be more practical to treat individual processing solutions selectively with ozone. Work performed on a small laboratory scale indicated that ozone might best be used as a preliminary treatment for overflow color developer solutions, particularly those containing phenidone and hydroxylamine sulfate; as a preliminary treatment for other solutions containing large amounts of thiocyanate, formate, EDTA, or black-and-white developing agents; and, as a tertiary treatment and disinfectant for overall mixed waste after that waste had first been treated biologically. While ozone will not oxidize all the chemicals present in photographic processing effluents, ozone following biological treatment serves to destroy certain organics that biodegrade slowly, removing color and odors. (Orr-FIRL)
W76-01667

COATING RECLAIM AT CONSOLIDATED PAPERS, INC., WISCONSIN RAPIDS DIVISION,
Consolidated Paper, Inc., Wisconsin Rapids.
L. J. Welling, and W. C. Vreeland.
Tappi, Vol 58, No 9, p 105-107, September, 1975. 4 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Recycling, Costs, Biochemical oxygen demand, Landfill, Wisconsin.

In March 1974, a system was started to reclaim and reuse blade coating at the Wisconsin Rapids plant of Consolidated Papers, Incorporated. This system was designed from the results of tests run since 1970. A flow diagram of the coating waste clarifier system is presented. The blade coating reclaim system results in a conservation of raw materials of about 3-4 ton/day which represent a savings of nearly $150,000 on almost 1000 tons of blade coating reclaimed in 1974. The solids loading, BOD, and quantity of landfill are greatly reduced by the system. The tanks, piping, pumps, valves, automatic controls, and other associated equipment for the system cost about $65,000. The reclaimed coating is added to the size press coatings. Reclaimed coating color varies but these differences are easily controlled by the computer color control system. It is now necessary to add more antifoamer to the size press coatings. Spoilage of the reclaimed coating is another problem with reuse; the reclaimed coating must be treated properly and used promptly to prevent spoilage. (Orr-FIRL)
W76-01668

PROCESS FOR REDUCING THE AMOUNT OF CALCIUM CONTAINED IN MAGNESIUM-BASE WASTE SULFITE LIQUOR BY THE USE OF AN AMMONIUM COMPOUND AND ADDITIONAL CALCIUM,
R. Lahtvee, B. K. Sethi, and W. H. Stark.
Canadian Patent 974,353. Issued September 16, 1975. The Patent Office Record, Vol 103, No 37, p 1, September, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Calcium, Sulfite liquors, *Patents.

A patent has been issued for a process for reducing the amount of calcium contained in magnesium-base waste sulfite liquor. The quantity of calcium contained in such waste sulfite liquors is reduced by precipitating the calcium as calcium sulfite and separating the precipitate from the remaining waste sulfite liquor solution. The precipitation is effected by dissolving additional calcium, an ammonium compound, and a source of sulfite ions in the waste sulfite liquor. The ammonium compound is selected from the group consisting of anhydrous ammonia, ammonium sulfite, aqueous ammonia, ammonium carbonate, ammonium magnesium carbonate, and ammonium hydroxide. (Orr-FIRL)
W76-01669

CONSOLIDATED PAPERS WILL SWITCH FROM GAS TO COAL AND BARK BY INSTALLING NEW BOILER.
Paper Trade Journal, Vol 159, No 22, p 17, September 15, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Pollution abatement, Activated sludge, Aeration, Treatment facilities, Municipal wastes.

A $6 million coal and bark burning boiler and a $4 million addition to the pollution abatement facilities are being constructed at the Wisconsin River Division of Consolidated Paper, Incorporated. The reduction in available natural gas has necessitated the switch to coal and bark for power. The new boiler plant, to be completed in mid-1976, will also be able to burn municipal refuse. The addition to the pollution control facilities, to be completed in July 1977, will be a secondary treatment plant which will consist of a 24-hr split basin, low-rate activated sludge system with a 3 mgd capacity. Two new clarifiers will be installed, and the existing primary treatment clarifier will be converted to

a secondary clarifier. Plans for the facilities also include subsurface aeration, and a liquid heat exchanger to maintain bacteriological activity during extremely cold weather. (Orr-FIRL)
W76-01671

REMOVAL OF SODIUM CHLORIDE FROM PULP MILL OPERATIONS,
Erco Envirotech Ltd., Toronto (Ontario).
J. A. Lukes.
United States Patent 3,909,344. Issued September 30, 1975. Official Gazette of the United States Patent Office, Vol 938, No 5, p 2379, September, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, *Pulp wastes, *Patents, Sodium chloride, Crystallization, Evaporation.

A method for the removal of sodium chloride from pulp mill operations has been patented. The method is designed to be used in pulp mill process which comprise digesting cellulosic fibrous material with a pulping liquor containing a minimum of one active pulping chemical, separating the pulped material from the spent pulping liquor, and forming a solid mass containing sodium carbonate from the spent pulping liquor. The patented improvement is to dissolve part of the solid mass in an aqueous material to form a hot aqueous solution, provide sodium chloride in the hot aqueous solution, and cool the hot aqueous solution to crystallize hydrated sodium carbonate almost to the point of saturation of the cooled solution with sodium chloride. The crystallized hydrated sodium carbonate formed is almost completely free from contamination by sodium chloride. The crystallized hydrated sodium carbonate is separated from the resulting saturated sodium chloride solution. The sodium chloride solution is further evaporated to deposit sodium chloride which is then separated from the resulting mother liquid. (Orr-FIRL)
W76-01672

SOME PROBLEMS OF TEXTILE MILL-GENERATED WASTEWATER TREATMENT IN THE LODZ URBAN AGGLOMERATION (NIEKTORE PROBLEMY OCZYSZCZANIA SCIEKOW PRZEMYSLU WLOKIENNICZEGO NA TERENIE LODZKIEJ AGLOMERACJI MIEJSKIEJ),
M. Lebiedowski.
Zeszyty Naukowe Politechniki Lodzkiej, Budownictow, No 15, p 69-83, 1975. 5 fig, 3 tab, 15 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Sewage, Detergents, Biological treatment, Operating costs.
Identifiers: Physico-chemical treatment.

The problems associated with the treatment of wastes from the textile industry discharged into the municipal sewage system in the Lodz, Poland, area are presented. The effect of nonionic, only partially decomposing detergents on the type of sewage treatment method chosen are discussed. Biosorption is proposed as the basis for two methods of treating sewage containing up to 50 mg/liter of these detergents. The cubic content of a sewage treatment plant utilizing physico-chemical treatment methods is compared with the capacity of biological treatment plant. Even if two-stage biological treatment is used, the cubic volume of a biological treatment plant will be less than the volume of a physico-chemical plant. In addition, the operating costs are lower and the sludge problems are easier to remedy for a physico-chemical plant. Biological treatment should be considered as the first stage of treatment in a system of complete utilization of industrial water in closed cycles. (Takacs-FIRL)
W76-01673

BIOFILTRATION SYSTEM FOR FABRIC PRODUCER.
International Dyer, Textile Printer, Bleacher and Finisher, Vol 154, No 4, p 169, August 15, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Filtration, Plastics, Activated carbon, Color.
Identifiers: *Biofiltration, Flocor.

The original activated sludge treatment system at the Laura Ashley factory in Carno, Wales, G.B., a major producer of fashion fabrics and dresses, was unable to handle the daily flow rate of 100,000 gal, with a BOD level of 1700 mg/liter, suspended solids content of 40 mg/liter, and the presence of solvents. A plant survey and waste treatability study indicated that a combination of high-rate and low-rate biofiltration would be the most economical and effective treatment technique. In the first phase of the two-phase treatment plant, the effluent passes over two towers each packed with 278 cu m of Flocor E high-rate plastic media, and then goes to settlement tanks. The load is reduced by 50 percent and then by 75 percent. The Royal Commission Standard is obtained by final treatment of the waste water over 294 cu m of high-surface-area plastic random media, Flocor RC. Phase 2 of the treatment plant is activated carbon treatment for color removal. (Orr-FIRL)
W76-01674

HYDROCYCLONE FOR CLARIFYING WOOL-WASHING LIQUID,
B. V. Arkhipov.
Soviet Patent SU 440156. Issued February 14, 1975. Soviet Inventions Illustrated, Vol W, No 29, p D3, August 26, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Patents, Equipment.
Identifiers: Wool-scouring liquors, *Hydrocyclone.

A hydrocyclone for clarifying wool-scouring liquid has been patented. The hydrocyclone contains a vessel with a chute for the heavy fraction, a tangentially mounted inlet nozzle, an outlet trough with an outlet nozzle, and a rotor rigidly fastened on a drive shaft. The rotor has external ribs and a conical cavity. The shaft has an axial cavity with radial channels. The improved design of the centrifugal rotor, incorporating the cylindrical and vertically ribbed external surface, will increase the efficiency of clarification of wool-scouring liquid in the initial wool processing treatment. The inner conical cavity of the rotor is connected to the axial cavity of the shaft. The conical cavity increases the area of contact between the fluid and the rotor, as well as the force which throws the heavy fraction towards the walls of the vessel. (Orr-FIRL)
W76-01675

THE TREATMENT OF TEXTILE DYEHOUSE EFFLUENT.
Effluent and Water Treatment, Vol 15, No 8, p 421, August, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Filtration, Clarification, Biological treatment, Pilot plants.
Identifiers: Biofiltration, Flocor, Acalor High Rate Biofilter Plant.

The results of a pilot plant incorporating plastic biofiltration medium to treat effluent from the textile works of John Heathcoat Limited, at Tiverton, G.B., demonstrated that the plastic biofiltration medium was capable of treating the effluent to the standards of the Devon River Authority. As a result of this conclusion, a one mgd full scale treatment plant was designed and installed at the textile works. Since the plant was to be located on the site of the existing raw water concrete and brick clarification lagoon, a new clarifier system had to be chosen. After considering a number of clarification systems, a recirculating solids contact clarifier was picked; this system includes flocculation and clarification within the same compact basin which occupies only 25 percent of the space of the original basin. The treatment facility is an Acalor High Rate Biofilter Plant with 60,000 gal capacity balancing facilities, and automatic pH control and reagent feed facilities. The biofilter tower is packed with 226 cu m of Flocor plastic filter medium. Advantages of the plant include a minimum of space required, little maintenance, and no operational problems. The plastic biofilter can also handle shock loads of BOD. (Orr-FIRL)
W76-01676

THE RECOVERY OF METALS FROM RINSE WATERS IN 'CHEMELEC' ELECTROLYTIC CELLS,
Electricity Council Research Centre, Capenhurst (England).
C. L. Lopez-Cacicedo.
Transactions of the Institute of Metal Finishing, Vol 53, Part II, p 74-77, Summer, 1975. 2 fig, 5 tab, 14 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Electrolysis, Costs, Operating costs.
Identifiers: Chemelec cells, Electrolytic cells.

Electrolytic extraction of metal from plating rinse waters is the only method capable of recovering the metal as pure metal. Chemical precipitation, solvent extraction, ion exchange of reverse osmosis will recover metal as concentrated solutions or sludges. The performance of Chemelec cells is compared with other types of electrolytic cells. Chemelec cells are a combination of mesh electrodes and non-conducting fluidized beds. Experiments were performed with copper, zinc, and nickel deposition in Chemelec cells. The Chemelec process is economical in terms of obtaining a high purity metal deposit from the metal in the rinse waters which can be reused or sold. In addition, the process effects a water savings. A plant using the Chemelec system to recover 20 ton of metal/year would cost around 10,000 pounds for cells, pumps, piping, rectifier, electrodes, and associated equipment. Operating costs would be about 75 pounds/ton of copper, if copper starting mesh is used. Titanium mesh would lower the cost to about 55 pounds/ton of copper. Conventional electrolytic cells would require a larger plant, rectifier, and other equipment than Chemelec cells. The capital costs of a plant employing conventional cells would be about 15,000 pounds and the operating costs would be about 160 pounds/ton copper. In determining the total economics, the costs that can be offset against expenditure (value of the metal recovered and water savings) must be estimated in each situation. Chemelec cells have proved economical in laboratory and pilot plant tests. This process should now be tested in a plating shop. (Orr-FIRL)
W76-01677

PRACTICAL GUIDE TO TREATMENT OF CHROMIUM WASTE LIQUORS,
Allied Chemical Corp., Syracuse, N.Y. Industrial Chemicals Div.
J. Kraljik.
Metal Finishing, Vol 73, No 10, p 49-55, October, 1975. 3 fig, 1 tab, 20 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Chromium, Standards, Legislation, Sewers, Activated carbon, Chemical precipitation, Ion exchange, Evaporation, Treatment facilities.
Identifiers: Electroplating wastes.

Some of the current water pollution control legislation for the electroplating industry and some means of meeting the effluent limitations are discussed. The Environmental Protection Agency (EPA) has stated that effluent limitations should

be based on the weight of pollutant per unit of plated area rather than on ppm so that limitations will not be met by simple dilution of the waste stream. The EPA limitations for existing plants and new plants are listed. EPA has also released standards for the discharge of electroplating effluents into municipal sewers. These standards are designed to protect the operation of municipal treatment plants and to prevent the introduction of any pollutant which may not be adequately treated. Chromium plating wastes can be reduced with sodium metabisulfite, sulfur dioxide and ferrous sulfate in batch, continuous, and integrated treatment systems. Other treatment methods discussed include electrolytic reduction, direct precipitation with barium salts, activated carbon adsorption, ion exchange, evaporation, and electrodialysis. The factors involved in the choice of treatment facilities and method are also discussed. (Orr-FIRL)
W76-01678

AUTOMATIC SYSTEM PURIFIES PRE-FINISH EFFLUENT AT 45 GPM,
Ball Corp., Denver, Colo. Ball Metal Container Corp.
D. A. Davis, and R. F. Reeves.
Industrial Finishing, Vol 51, No 40, p 30-36, October, 1975. 1 fig, 5 photos.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Sewerage, Neutralization, Oily water, Separation techniques.

The treatment plant for the new aluminum can manufacturing plant of the Ball Metal Container Group, Ball Corporation, at Williamsburg, Virgina, automatically handles all effluent generated in producing 1.5 million two-piece cans daily. The wastes are treated at the plant and then released into the James City County sewer system. The discharged wastes must be free of oils, metal ions, suspended solids, floatable materials, flammable substances, and have a pH of 6.5 to 9.0. The liquid wastes originate from the three can washing processes each consisting of six stages. Each can finishing line produces an average of 15 gpm of wash waters. The treatment system consists of a 4-section tank for equalization, chromate reduction, reaction, and neutralization, followed by a thickener for liquid/solids separation, an oil skimmer and collection sump, emergency dump tank, holding tank, and a final sampling and recycling basin. Half of the treated water from the thickener is reused to conserve water and reduce the total plant effluent. The rest of the water is discharged to the sewer system and receives additional biological treatment before being released into the James River. (Orr-FIRL)
W76-01679

FLUID BED INCINERATION OF WASTES CONTAINING ALKALI METAL CHLORIDES,
Dorr-Oliver Inc., Stamford, Conn. (assignee)
E. J. Roberts, and P. A. Angevine.
United States Patent 3,907,674. Issued September 23, 1975. Official Gazette of the United States Patent Office, Vol 938, No 4, p 1835-1836, September, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Patents, *Incineration, Sulfur.
Identifiers: Fluidized bed incineration.

A method for the fluid bed incineration of alkali metal chloride containing wastes has been granted a patent. The process is designed for the fluid bed incineration, in the presence of sulfur or sulfurous compounds, of an aqueous combustible organic waste stream contaminated with a minimum of one alkali metal chloride. A body of particulate material is first fluidized in a reaction chamber by passing an upwardly flowing stream of air through the body. The fluidized body is then maintained at a temperature between 800 C and 1000 C in order to burn the organic material and volatilize most of the alkali metal chloride. The unvolatilized alkali metal remaining in the bed is expressed in terms of water-soluble and water-insoluble sodium. Finely divided SiO2 and at least one metal oxide selected from the group consisting of CaO, MgO, Al2O3, and Fe2O3, are introduced into the reaction chamber for reaction with the remaining portion of alkali metal; this forms high-melting alkali metal crystalline compounds. The gaseous and solid reaction products are finally discharged from the reaction chamber for disposal or further treatment. (Orr-FIRL)
W76-01680

AES PROJECT 32, TREATMENT OF ELECTROPLATING WASTES BY REVERSE OSMOSIS.
Plating and Surface Finishing, Vol 62, No 9, p 877, September, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Reverse osmosis, Membrane processes, Pilot plants.
Identifiers: *Electroplating wastes, Copper cyanide wastes, Zinc cyanide wastes, Zero discharge.

American Electroplaters' Society's (AES) Project 32 is an investigation of the feasibility of using reverse osmosis (RO) for the treatment of electroplating wastes. The main concern is closed-loop treatment of rinse water from specific plating baths with recycle of the valuable plating-chemical concentrate to the plating bath and recycle of the purified water to the rinsing operation. Pilot-scale tests showed that RO was a promising technique for the treatment of rinse water from the following baths: Watts-type nickel; nickel sulfamate; nickel fluoborate; copper pyrophosphate; copper cyanide; zinc chloride; zinc cyanide; and cadmium cyanide. RO did not appear promising for the direct treatment, without nuetralization, of chromic acid wastes. The results from field tests demonstrated the RO can be used to close the loop in copper cyanide plating. Future plans for this project include laboratory tests to be conducted on a zinc cyanide plating solution to determine the stability of the polyamide membrane at high pH values. If the stability is good, a full-scale field demonstration will be conducted using a combined RO-evaporation system for the closed-loop recovery of zinc cyanide rinse water. (Orr-FIRL)
W76-01681

BIOLOGICAL REGENERATION OF ACTIVATED CARBON IN ADVANCED WASTEWATER TREATMENT,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering.
R. L. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 298, $5.00 in paper copy, $2.25 in microfiche. Completion Report, June 1975, 89 p, 29 fig, 7 tab, 16 ref. OWRT A-032-PA (1) 14-31-0001-5038.

Descriptors: *Carbon, *Activated carbon, Sands, *Aeration, Costs, *Waste water treatment, Biochemical oxygen demand, *Chemical oxygen demand, Biological treatment, *Tertiary treatment.

Enhancement of biological activity was used for off-line batch regeneration of exhausted carbon and in aerated contactors for in-situ regeneration. After three off-line batch biological regeneration cycles, the carbon capacity exceeded 1.0 lb COD/lb with no apparent reduction in the COD removal rate compared to virgin carbon. In 200 days of aerated contactor operations the apparent capacity was 1.87 lbs COD/lb carbon. The influent COD of 94.6 mg/l was reduced to 30.4 m/l at 1.5 gpm/sq ft with 25 minutes detention. A parallel aerated sand contactor removed over 140 lbs COD/day per 1000 cu ft (ptcfd) at 340 ptcfd loading rate. Carbon operating costs for small physical-chemical treatment plants could be reduced 50% by using aerated contactors and comparable economic savings can be achieved by using the biological activity in tertiary treatment.
W76-01684

THE PREPARATION AND OXIDATIVE PROPERTIES OF FERRATE ION (FEO42-) STUDIES DIRECTED TOWARD ITS USE AS A WATER PURFYING AGENT, PHASE II,
Missouri Univ., Columbia. Dept. of Chemistry.
R. K. Murmann.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 312, $3.50 in paper copy, $2.25 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, October 1975, 17 p. OWRT B-109-MO (1) 14-31-0001-5086.

Descriptors: Water pollution, Water treatment, *Waste water treatment, *Oxidation, Water purification, *Ions, *Iron oxides, Odor, Bacteria, Sedimentation rates, *Viruses.
Identifiers: *Odor removal.

The effectiveness of FeO42- as a water purifying agent is described with respect to increasing sedimentation rates, removing foreign positive and negative ions, oxidizing organic and inorganic substances, inactivating virus, destroying bacteria and odor removal. Studies on stability to storage, methods of preparation and cost estimation have been made with the conclusion that in many types of water purification, Fe042- has advantages over existing means. Theoretical studies on oxygen transfer, mechanisms of reaction and the ion Fe042- are summarized. (See also W75-02707)
W76-01687

CLEANING COAL WITH COAL: COAL HUMIC ACIDS FOR REMOVAL OF ACID, IRON, HEAVY METALS, AND ORGANIC POLLUTANTS ASSOCIATED WITH USE OF COAL AS A FUEL,
Missouri Univ., Columbia. Dept. of Chemistry.
S. E. Manahan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 313, $4.00 in paper copy, $2.25 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, August 21, 1975. 39 p, 5 fig, 7 tab, 1 ref. OWRT B-110-MO (1) 14-31-0001-4170.

Descriptors: *Coal, Acid mine water, Iron, *Humic acids, Copper, Cadmium, Neutralization, *Ion exchange, Chelation, Heavy metals, Organic wastes, *Waste water treatment, Acids, Cation exchange, *Missouri.
Identifiers: Surface oxidized coal.

Cation exchangers were prepared by surface oxidizing Missouri bituminous coal with 6 M nitric acid through which air was bubled. The treament introduces oxygen-containing functional groups on the coal surface producing an ion exchanger with acid-base properties and the capability of chelating metal ions. The sodium form of the ion exchanger removed sulfuric acid from water raising the pH from 1.5 to more than 8. Ferrous iron at 25 mg/l in pH 1.5 sulfuric acid (Simulating acid mine water) was removed to less than 0.2 mg/l by the sodium form of the ion exchanger. A similar solution of ferric iron was lowered from 100 mg/l to about 0.5 mg/l by the same treatment. The treated coal was found to chemically reduce some iron (III) to iron (II). When passed over the acid form of the coal ion exchanger, copper and cadmium levels in neutral solution were lowered from 10 mg/l to 0.01 and 0.00 mg/l, respectively, and from 50 mg/l to 0.02 and 0.01 mg/l respectively. The low ion exchange capacity of surface treated coal limits its usefulness in treating water. Base-soluble coal humic acid has a much higher ion exchange capacity, and work is continuing on its use for wastewater treatment.
W76-01688

FACTORS AFFECTING SLIME ACCUMULATION IN FIBERBOARD MILL PROCESS WATER,
Oregon State Univ., Corvallis. Dept. of Microbiology.
M. P. Minelli, and A. W. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 278, $4.50 in paper copy, $2.25 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-36, October 1975. 59 p, 10 fig, 5 tab, 36 ref. OWRT A-026-ORE (1).

Descriptors: *Sludge treatment, Slime, *Activated sludge, *Waste treatment, Waste water treatment, Molds, Aeration, Industrial wastes, Water pollution control.
Identifiers: *Mill process water, Fiberboard, Geotrichum candidum.

The objectives were to determine the causes of slime formation in activated sludge treatment and to recommend possible control measures. The primary problem was a seasonal filamentous bulking which was caused by the mold, Geotrichum candidum. During the winter, mycelial fibers appeared and formed a free floating mesh which harbored a community of bacteria, yeasts and rotifers. The highly encapsulated mycelial filaments were assumed to utilize the free wood sugars to form its capsular polymer. The biological transformation of free wood sugars into polymerized slime could be followed through the treatment steps by gas-liquid chromatography. The research data indicated that by by-passing the primary settling basin, thus avoiding the anaerobic degradation of the free wood sugars, the formation of the troublesome polysaccharides in the aeration pond could be avoided. After a rapid screening to remove the particulate matter, direct aeration at a pH of approximately 7.0 allowed a well balanced, nonfilamentous, microbial population to predominate.
W76-01689

FATE OF NITROGEN IN SEWAGE EFFLUENT APPLIED TO SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5B.
W76-01696

PROCESS FOR THE CLARIFICATION OF BRINE,
International Minerals and Chemical Corp., Libertyville, Ill (assignee).
W. B. Dancy.
U.S. Patent No 3,904,520, 6 p, 6 ref; Official Gazette of the United States Patent Office, Vol 938, No 2, p 766, September 9, 1975.

Descriptors: *Patents, *Brines, *Brine disposal, *Waste water treatment, *Water pollution treatment, Floculation, *Liquid wastes, Slurries, Mixing, Filtration.
Identifiers: Sylvinites.

Sylvinite plant brine thickener underflow, which comprises an essentially saturated sodium chloride-potassium chloride brine containing clay slimes in amount such as 5% and ore fines in amounts such as 20%, is clarified to provide an essentially solids-free brine by preparing a slurry consisting of an intimate admixture of clear sylvinite brine, halite tailings, and a small but effective amount of a suitable flocculent. The slurry is agitated and admixed with an equal or greater amount by weight of sylvinite brine thickener underflow, and the resulting mixture is filtered to recover clarified brine. In a preferred embodiment, the slurry and underflow are heated prior to filtration to dissolve solid potassium chloride in the ore fines and the clarified brine is cooled to crystallize solid potassium chloride, which is recovered. (Sinha-OEIS)
W76-01713

INSTALLATION FOR SEWAGE TREATMENT,
Cherne Industrial, Inc., Edina, Minn (assignee).
L. G. Cherne, H. C. Grounds, and H. O. Halvorson.
U.S. Patent No. 3,905,904, 4 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1235, September 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Aeration, *Activated sludge, Microbial degradation, Water quality, Flow control, Equipment.

The invention provides a method of sewage treatment utilizing an acitvated sludge sewage aeration treatment area, such as a sewage treatment channel which provides a variable volume reservoir wherein the volume of sewage under treatment may vary over a substantially broad range, and a sludge settling treatment area. The method comprises the steps of delivering sewage, which is at most partially treated and may include infiltration flow from ground and surface water, into the activated sludge sewage aeration treatment area at variable volume rates which can change from moment to moment during a predetermined daily time period; aerating and circulating the sewage and thereby providing a variable volume mixed liquor of aerated sewage and sludge including microorganisms and solids for further treatment; feeding mixed liquor from the aeration treatment area to the sludge settling treatment area; and treating such mixed liquor at such substantially constant volume rate including separating the sludge from the mixed liquor and discharging the remaining clear liquid effluent from the sludge settling area. The control device may involve a constant volume pump and a control valve which can deliver a constant volume rate regardless of variations in depth. Other flow control devices such as floating weirs can also be used. (Sinha-OEIS)
W76-01715

AEROBIC SEWAGE DIGESTION SYSTEM,
G. A. Milne.
U.S. Patent No 3,907,672, 6 p, 6 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 938, No 4, p 1835, September 23, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Domestic wastes, Water quality control, Water pollution control, *Aeration, *Sludge digestion, Anaerobic bacteria, Aerobic bacteria, Clarification, Equipment.

The invention combines all desirable steps of sewage treatment with a single tank which is self contained. The tank is divided in sections; so that the sewage may be treated in stages. The objectives of the invention are accomplished by providing a large sealed tank with a waste water influent opening into a first pretreatment settlement chamber and with an outflow from that chamber into an aeration chamber where oxygen is added to the air bearing waste water from which solids have been precipitated. The suspended and dissolved solids are acted upon by aerobic bacteria while circulation within the aeration chamber is encouraged. The the aerated waste water is flowed into a tank where flow is slowed and where materials are again precipitated to clarify the liquid. The clarified liquid then flows out of the tank. While the invention is particularly useful for complete sewage treatment systems for single family units and multiple family units, it has application to sewage treatment systems of varied sizes and can be used as an interim sewage treatment facility before a final system is provided. (Sinha-OEIS)
W76-01717

TREATING WASTE,
Fram Corp., East Providence, R.I. (Assignee).
T. E. Bołk, S. S. Blecharczyk, and E. L. Shunney.
U. S. Patent No 3,907,673, 4 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 938, No 4, p 1835, September 23, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water quality control, *Filtration, Aeration, Packed beds, Adsorption, Equipment.

The invention provides effective treatment of waste produced in small quantities with apparatus that is self-contained, compact, lightweight (e.g., easily installed and carried on a ship), and inexpensive. The invention features a waste treatment system comprising a receiver tank having an inlet for receipt of waste, means for connecting the reciever tank inlet to a source of the waste, and at least one treatment tank connected downstream of the reciever tank for mechanical filtration of solid contaminants and adsorption of liquid contaminants contained in the waste. The treatment tank has a packed bed of adsorbent particles, means to aerate and fluidize the bed of the treatment tank including an aeration inlet below the bed. The tank has a liquid outlet, a recirculation line connected from the liquid outlet to the upstream of the treatment tank and valves connected for control of flow in the system during a treatment cycle. An aeration and fluidization cycle in which air flows through the inlet of the treatment tank fluidizes and biologically regenerates the adsorbent particles. In the recirculation cycle the waste flow through the recirculation line and down through the treatment tank in the opposite direction as the air flow during the aeration and fluidization cycle to reestablish the bed and discharge loosened solids. (Sinha-OEIS)
W76-01718

PURIFICATION OF INDUSTRIAL WASTE WATER,
Regie Nationale des Usines Renault, Paris (France); and Regie Nationale des Usines Peugeot, Paris (France).
R. A. Basseet.
U.S. Patent No 3,907,682, 4 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 938, No 4, p 1838, September 23, 1975.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Industrial wastes, Water quality control, Water pollution control, Heat exchangers, Heat flow, *Separation techniques, Thermal conductivity, Convection, Currents(Water), Density currents.

An apparatus is described for purifying industrial waste water so that the various phases of different density can be separated. The waste water contains soluble oils or chemically synthesised liquids which are used as additives in cutting and cooling liquids for machine tools used for metal working. This apparatus is located at the first stage of regeneration where the pre-treatment intended to separate the light and heavy phases and the water takes place. The first compartment in the pretreatment tank has an anti-turbulence partition and a thermal partition, and a heating device having a large heat-exchange area. The heating device when operated sets up convection currents between these two partitions to facilitate the separation of the phases. The anti-turbulence partition may take the form of a perforated plate and the heating device is controlled by a regulating thermostat. The convection currents make it possible to separate the various phases contained in the incoming water in such a way that a state of equilibrium is set up in which the light phase, the intermediate phase and the heavy phase come to lie one above the other. (Sinha-OEIS)
W76-01721

PROCESS OF TREATING WASTE WATER,
Fuji Photo Film Co. Ltd., Kanagawa (Japan). (assignee)
A. Abe, and Y. Usui.
U.S. Patent No 3,909,403, 11 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2394-2395, September 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, Ion exchange, *Anion exchange, Separation techniques, Degradation, Chemical degradation.
Identifiers: Photographic processing, Ferrocyanide ions, Ferricyanide ions.

This invention provides a process of treating waste water containing ferricyanide ions and/or ferrocyanide ions which comprises bringing the waste water containing these ions in contact with a weakly-basic anion-exchange resin. The ions from the waste water are absorbed by the weakly-basic anion-exchange resin which is removed and immersed in an alkaline solution to provide an alkaline concentrated solution of the ions. A strong alkali, a hypochlorite and bromide ions are added to the concentrated solution to adjust the pH of the solution to above 12, and the mixture is heated to temperatures above 50 deg C at normal pressure whereby the ferricyanide ions and/or the ferrocyanide ions are decomposed. (Sinha-OEIS)
W76-01726

CLARIFYING AGENTS FOR WATER,
J. L. Lang.
U.S. Patent No 3,909,406, 5 p, 9 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2395, September 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Industrial wastes, Liquid wastes, *Water purification, Flocculation, Suspended solids, Separation techniques, Settling basins.

This invention provides a process which uses a new flocculating system which settles suspended solids from water at a rapid rate, and produces a satisfactorily clear supernatant portion which may be readily removed as purified water. The flocculating and settling agents are physiologically inert, and non-contaminants in terms of the effects of them upon plants and animals. These compounds are essentially those of polyvalent cations with anions such as aluminate, polyaluminate, aluminosilicate, poly aluminosilicate, borate, poly borate, and the like. The materials are prepared by calcining, i.e., heating at temperatures at which water and carbon dioxide are at least partly expelled. The use of these new clarifying agents is easily carried out, usually by simply mixing the untreated water with either the dry pulverized clarifying agent or a slurry thereof in water, allowing flocculation to take place in a quiescent or gently agitated settling zone, and the purified water removed by decantation, siphoning, pumping off, filtration or any of the known methods or combinations. Recycling of the used clarifying agents is possible using these materials, especially when the flocculated solids are incinerated during the ultimate disposal step. (Sinha-OEIS)
W76-01727

TREATMENT OF WOOL SCOURING WASTES,
George W. Bollman and Co., Inc., Adamstown, Pa. (assignee)
W. A. Heisey.
U.S. Patent No 3,909,407, 5 p, 1 fig, 4 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2395, September 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Textiles, *Detergents, Sludge, Heat treatment, Flocculation, Centrifugation, Separation techniques.
Identifiers: *Wool scouring wastes.

The primary object of this invention is to produce a supernatant liquor and a conditioned non-drainable sludge which rapidly, gravity settles so that the supernatant liquor can be discharged directly into a municipal sewer system at acceptable COD levels and the sludge can be continuously and efficiently separated by a solid bowl centrifuge into disposable liquid and solid constituents. A method is provided which will produce sufficient purification of both the liquid and solid components of the wool scouring wastes to permit discharge of these components by conventional methods. In a continuous process the scouring liquor at an elevated temperature is acidified and treated with bentonite while continuously mixing. The acidulated liquid is treated with lime and flocculated while continuously mixing, again at an elevated temperature. Finally the conditioned mixed liquor is transferred to a settling tank where the sludge is removed for further treatment and clear liquid is drawn off for discharge into a sewer system. (Sinha-OEIS)
W76-01728

PROCESS FOR TREATING SEWAGE SLUDGE,
H. H. Neukamm.
U.S. Patent No 3,909,410, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2396, September 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, *Sludge treatment, *Sludge disposal, Drying, Sewage sludge.

An improved method is described for treating sewage sludge. The sludge in the form of a slurry is continuously distributed onto preheated aggregate pieces which are continuously fed into a lower region of a rotating contractor drum. A portion of the slurry instantaneously adheres to the heated aggregate and the non-adhering slurry passes through perforations in the drum for recycle. The aggregate with adhering sludge is carried upward by means of baffles in the drum and is dumped into a collector trough in the upper region of the drum. This coated aggregate is subjected to further heating as it travels down an inclined path to dry the coating into a hard encrustation and enters a tumbler drum which breaks the sludge coating away from the aggregate and pulverizes the sludge into a dust or powder. This dust is collected as product and the decoated aggregate is recycled. (Sinha-OEIS)
W76-01730

MAINTENANCE OF WATER QUALITY,
For primary bibliographic entry see Field 5G.
W76-01735

EXTENDED WASTE WATER PURIFICATION IN A GROUP SEWAGE PLANT AS PROTECTIVE MEASURE FOR A LEAK (WEITGEHENDE ABWASSERREINIGUNG IN EINEM GRUPPENKLAERWERK ALS SEENSCHUTZMASSNAHME),
T. Lanowy.
Vom Wasser, Vol 43, p 193-214, 1974. 12 fig, 4 tab, 11 ref.

Descriptors: *Waste water(Pollution), *Water purification, *Sewage treatment, Flood protection, Potable water, Treatment facilities, *Waste water treatment, Industrial wastes.
Identifiers: *Bystrzyca river(Poland), *Lubachow reservoir(Poland), Sanitation problems, Municipal-industrial wastes.

When water, which was originally impounded for flood protection and energy generation, is used for drinking purposes, it is necessary to reorganize the water and sewage policies in the catchment area of the impounding reservoir and to solve numerous sanitation problems. These problems are discussed with reference to the catchment area of the Bystrzyca river and the Lubachow reservoir in Poland. The intended reorganization of water uses will involve: construction of a group sewage plant for about 15000 cu m waste water/day, including a collector to direct the water around the reservoir; construction of a plant for the treatment of impounded water intended for industry located in the neighborhood of the river basin; incorporation of artificial aeration of the reservoir; and construction of an extensive sewage purification plant from which water can be fed into the reservoir when the flow of main tributary water is low. Since the waste water to be handled contains more than 62% industrial effluent from dye-house works, tanning factories, spinning mills, and other factories, considerable difficulties will be met in its treatment, particularly with regards to decoloration. The results of investigations carried out in an experimental sewage purification plant as well as the potentiality of recovering drinking water with the aid of ion-exchange, electrodialysis, and activated charcoal filtration processes are discussed. A detailed program of industrial investigations is needed to find the optimum sewage purification process. (Pinto-FIRL)
W76-01737

SAND FILTER AND WASTE STABILIZATION POND TEST SHOWS POSSIBILITY FOR TREATMENT OF INDIVIDUAL WASTEWATER DISPOSAL,
Public Health Service, Grant, N. Mex. Div. of Indian Health.
M. L. Beard, and C. H. Lawrence.
Journal of Environmental Health, Vol 38, No 1, p 43-44, July/August, 1975. 1 tab, 10 ref.

Descriptors: *Waste water treatment, *Septic tanks, Biochemical oxygen demand, Chemical oxygen demand, Nitrates, Coliform, Effluents, Standards, Waste water disposal.
Identifiers: *Sand filters, *Waste stabilization ponds.

iIn order to determine whether or not waste stabilization ponds and sand filters are capable of treating individual dwelling or housing cluster wastes to a level of effluent superior to the conventional septic tank, four such ponds and four such filters were sampled. Bacteriological, chemical, and biochemical analyses were made for each system. A wide range of loading conditions were chosen and each unit was sampled weekly for one month. Sand filters were 20 ft by 40 ft by 4 1/2 ft and were preceded by sedimentation in conventional septic tanks. The waste stabilization ponds served households receiving untreated well water and each was also preceded by a septic tank for sedimentation. Effluent samples from all eight units were analyzed using Standard Methods for BOD, COD, nitrates, and fecal coliform. The sand filters produced better BOD, COD, and suspended levels than did the waste stabilization ponds. However, the performance of the ponds was better in terms of producing a much lower nitrate concentration and low levels of effluent fecal coliform. It was concluded that both types of units meet Federal effluent standards and do provide a suitable alternative to the conventional septic tank system for disposal of domestic waste water. (Kramer-FIRL)
W76-01738

THE DEGRADATION OF ORGANIC POLLUTANTS IN WATER BY OZONE (UEBER DEN ABBAU VON ORGANISCHEN SCHADSTOFFEN IM WASSER DURCH OZON),
E. Gilbert.
Vom Wasser, Vol 43, p 275-290, 1974. 14 fig, 6 tab, 8 ref.

Descriptors: *Ozone, *Chlorine, Penols, *Waste water treatment, Waste treatment, Oxidation, Organic compounds, *Biodegradation.

In water with an initial pH of 5, ozone is used in the oxidative degradation of monochlorophenols, dichlorophenols, 2,4,6-trichlorophenol and 2,3,4,5-tetrachlorophenol. The process dechlorinates and breaks up the aromatic ring. Organic chlorine is converted to chloride, with the yield of the resulting chloride being between 60 and 95% of the theoretical value. The yield is dependent upon the position of the chlorine atom with respect to the OH-group and 3.5 to 5 mmoles

of ozone are needed for the complete degradation of one mmole of chlorophenole, corresponding to an ozone consumption of 50 to 60%. The oxidation products were seen to be biodegradable. The oxidation of 2,4-dichlorophenol was not affected by glucose, deoxyribose or glutamic acid. (Kramer-FIRL)
W76-01739

UNOX SYSTEM PILOT PLANTS-TWO YEARS' EXPERIENCE WITH PURE OXYGEN IN THE ACTIVATED SLUDGE PROCESS,
D. Steen, and R. W. Fuggle.
The Public Health Engineer, No 16, p 91-104, July, 1975. 4 fig, 8 tab, 7 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Sewage treatment, *Treatment facilities, Pilot plants, Oxygen, Sludge.
Identifiers: UNOX, High-purity oxygen activated sludge.

Three UNOX pilot plant programs have been conducted at three English sewage treatment works, Ray Hall, Birmingham; Slack's Valley, Oldham; and Saltford, Bath. Schematic diagrams are presented for the multistage UNOX system, the mobile pilot plant, and the two-stage system tested. Summaries of the performance of each of the pilot plants are discussed, and several conclusions are made from the results of the studies. UNOX plants are capable of operating with high concentrations of suspended solids and short retention times. Under these conditions, the effluents produced will still contain low BOD and suspended solids (SS) concentrations. A fully nitrified effluent has been obtained by using air aeration following the high rate removal of carbonaceous material by a UNOX system. Problems in achieving nitrification at one of the facilities was due to the presence of toxic substances and a low pH. Using pure oxygen for sewage treatment has maintained thick under flow concentrations for the settling basins except when the sewage contained high concentrations of filamentous organism. The UNOX system has operated without problems when sewage treated contained quantities of filamentous organisms that normally cause sludge bulking in air systems. The activated sludge in UNOX system has a rapid settling rate which shows little effect from sludge loading ariation. (Orr-FIRL)
W76-01740

SECONDARY TREATMENT AT LONG REACH,
F. D. Williamson.
The Consulting Engineer, Vol 39, No 8, p 31, August, 1975.

Descriptors: *Sewage treatment, *Waste water treatment, *Treatment facilities, Activated sludge, Construction, Aeration.
Identifiers: Long Reach Sewage Treatment Works(GB).

Work on the third and final stage of the extensions to Long Reach Sewage Treatment Works (England) has been initiated. This final stage will provide secondary treatment and improve sludge treatment and disposal, and is an important step in further reducing the pollution of the Thames estuary. The new plant will treat a dry weather flow of about 35 mgd. Secondary treatment is expected to reduce the effective oxygen demand (eod, a parameter that expresses the amount of oxygen required to oxidize both carbonaceous and nitrogenous substances in the effluent) by about 60%. Six aeration tanks are to be added together with associated liquor, settled sewage and return activated sludge channels. Provisions are being made for two additional tanks. Each tank will be 80 m 26.3 m by 4.4 m. Diffused air will be used to aerate the mixed liquor. Three motor driven turboblowers are being installed, with provision for two more. In order to reduce the chances of cracking of concrete due to shrinkage, construction of the floor and walls of the facility will be performed in short IL 'L'-shaped sections. Construction of a given section of a floor will be followed as soon as possible by construction of the corresponding wall section, so that shrinkage of the floor and wall will occur at the same time. (Orr-FIRL)
W76-01741

FACTORS TO CONSIDER WHEN SELECTING GRANULAR ACTIVATED CARBON FOR WASTEWATER TREATMENT,
ICI America Inc., Wilmington, Del.
P. B. DeJohn.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Part Two, Lafayette, Indiana, Purdue University, p 790-807, 14 fig, 12 tab.

Descriptors: *Waste water treatment, *Activated carbon, Lignite, Coals, Bituminous materials, Adsorption, Molecular structure.
Identifiers: Bituminous coal carbon.

The selection and use of granular activated carbon in waste water treatment were studied. Before selecting a carbon type, an analysis of cost is advisable; it should be made through a minimum of five adsorption-regeneration cycles. Performance deterioration and price differences between the two carbon types should also be kept in mind. The choice of a granular activated carbon should be based on its meeting effluent standards through impurity adsorption, on moderate losses during regeneration, on minimal pressure drop, absence of operating problems, and on the most economical operating cost. Adsorption data reveals that lignite carbon will be more efficient in dealing with waste water streams which contain pollutants with mostly large molecules while bituminous coal carbon will be preferable when working on streams with predominantly small molecules. In domestic waters, both carbons should give equivalent results. Regeneration data shows that lignite carbon regenerates more easily and under less severe conditions because of its larger pore structure and its greater inert ash content. (Waltner-FIRL)
W76-01742

OZONE DEGRADATION IN PACKED COLUMNS,
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
M. A. Kessick, and J. V. Matson.
Journal of the Environmental Engineering Division-ASCE, Vol 101, No EE5, p 883-886, October 1975. 2 fig, 4 ref.

Descriptors: Ozone, *Waste water treatment, *Chlorine, *Adsorption, Activated carbon, Zeolites.
Identifiers: Packed columns, *Ozone decomposition.

Ozone has been considered as an alternative disinfectant to chlorine in water and waste water treatment systems. One hazard of ozone treatment is an unacceptable level of gas that might be released to the atmosphere. To minimize this problem, ozone may be adsorbed into potassium iodide solution, thermally degraded in a flare, or decomposed in a packed column. The last of these procedures was evaluated by reaction zone analysis. Destruction of ozone was carried out for both dry and water-saturated gas streams. Carbon column packings of 21-g (49-ml bed volume) dried Pittsburgh Activated Carbon Type SGL 8-30 were used. For purpose of comparison, Linde Molecular Sieve type 13x, a zeolitic material, was evaluated by the same method for ozone decomposition ability. The activated carbon in a packed column demonstrated a performance markedly superior to that of the zeolite. The use of the carbon column was suitable for the continuous removal of small percentages of ozone from a wet or dry gas stream. Carbon was irreversibly degraded at the rate of approximately one g/4 g ozone destroyed. The weight loss (about 0.35 g/4 g ozone destroyed) indicated that a catalytic or thermal mechanism as well as a chemical reaction had contributed to the degradation. (Kramer-FIRL)
W76-01743

SANITARY SURVEYS AND SURVIVAL CURVES OF SEPTIC TANK SYSTEMS,
J. T. Winneberger.
Journal of Environmental Health, Vol 38, No 1, p 36-39, July/August, 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Septic tanks, *Surveys, *Sewers, *Sewerage, Public health, Costs, *Waste water treatment.
Identifiers: Septic tank survival curves.

An argument is presented in favor of reviewing presently operating septic tank systems rather than arbitrarily replacing them with sewers. It is believed that many federally funded sewerage projects have been unnecessary, and have led to urbanization of reluctant communities. Two unincorporated communities in California are compared, both with the same terrain and the same septic-tank practices. One had small, city-size lots and the other had larger lots. While septic tank problems in the city with the small lots were immediately realized when sewage spilled into a neighboring property, in the case of the large lots, nuisances were less often noticed. Survival curves and failure rates for the two systems were compared, and it was found that the small lots had a 17% failure, while the large lots had a failure rate of 15%, or about the same. The survival curves indicated that about 50% of the systems survived 25 years. This rate is deceptive, because the types of repair and amounts of time for the septic tank to again be operable vary. It was recommended that further sanitary surveys be conducted and that the choice of building sewer systems rather than improving septic tanks be re-evaluated. (Kramer-FIRL)
W76-01744

DEVELOPMENTS IN BACKWASHING OF GRANULAR FILTERS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
J. L. Cleasby, E. W. Stangl, and G. A. Rice.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE5, p 713-727, October, 1975.

Descriptors: *Water treatment, *Filtration, *Filters, Equipment, *Waste water treatment.
Identifiers: *Backwashing, *Filter cleaning.

Three methods of backwashing granular filters are evaluated. The effectiveness of: water fluidization only; air-scour followed by water backwash; and surface wash before and during water backwash were tested when filtering different types of waters. Previous studies have shown that the cleaning of granular filters by the upward flow of backwash water alone to fluidize the filter bed is a weak method because particle collisions do not occur in a fluidized bed. Therefore, auxiliary means of improving filter bed cleaning are employed. Experimental testing involved the utilization of three different filters operated in parallel, the filtering of water later followed by two different waste waters, sampling of influent and effluent flows, readings of turbidity and head loss, standard abrasion testing of core samples taken from the media after the backwash, and visual observation. Results support findings on the weakness of water fluidization only, and consolidate the advantages of the auxiliary methods in maintaining the filters in better condition. It was also found that heavy mud ball concentrations are undesirable since they increase initial head losses and help shorten filter cycles; filter cracking will let solids penetrate deeper into the filter and may lower filtrate quality in some instances. Proper backwashing with the auxiliary methods neces-

sitates the expansion of the coals and sands usually specified in dual and mixed media filters. Air-scour systems are described which require special attention in design and utilization. (Waltner-FIRL)
W76-01745

GREATER VANCOUVER OPENS ANNACIS TREATMENT PLANT,
G. Matheson.
Water and Pollution Control, Vol 113, No 9, p 14-16, September 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Automation, *Canada, Dewatering, Chlorination, Operating costs, Personnel.
Identifiers: *Vancouver(BC).

Greater Vancouver (British Columbia) Regional District's recently opened Annacis Island Sewage Treatment Plant is presently providing primary treatment while the Frazer estuary is being tested for possible secondary treatment. The plant is mainly concerned with the elimination of pathogens and toxicity to fish and with the preservation of the estuary's aesthetic qualities rather than with the maintenance of low nutrient levels. Designed to serve 490,000 people by 1986, it is also high automated; an older plant would employ one man per one mgd while the Annacis Island plant uses one man per three mgd. The processes involved in primary treatment comprise influent sampling, pre-chlorination, screening, pumping to preaeration and grit removal, followed by thickening, high rate digestion, and drying and storage in sanddyke lagoons; grit and scum dewatering; post chlorination in contact tanks with dechlorination; and effluent sampling, metering and discharge through an outfall fitted with diffusers. Operating costs are divided among the eleven municipalities according to the value of real property in the collection districts. (Waltner-FIRL)
W76-01746

PROCESS CLOSES LOOP ON SEWAGE TREATMENT.
Chemical and Engineering News, Vol 53, No 40, p 6-7, October, 1975.

Descriptors: *Sewage treatment, *Waste water treatment, *Pilot plants, Activated carbon, Heavy metals, Suspended solids, Standards, Costs.

A pilot plant is to be built in southern California which will test a new treatment process whereby solids in the sewage are converted to activated carbon. These are in turn utilized to treat the incoming waste water. The plant will be a magnification of an already existing mobile unit where the treatment process almost completely eliminated sewage solids, produced clean waste water and removed odors and heavy metals in the sewage. It is expected that the process will exceed EPA standards at a lower cost. (Waltner-FIRL)
W76-01747

ADSORPTION OF INORGANIC MATERIALS ON ACTIVATED CARBON,
Oak Ridge National Lab., Tenn.
F. Nelson, H. O. Phillips, and K. A. Kraus.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Part Two, Lafayette, Indiana, Purdue University, p 1076-1090. 20 fig.

Descriptors: *Waste water treatment, *Activated carbon, *Adsorption, Anions, Cations, Tracers, Analytical techniques, Laboratory tests.

Recent experiments dealing with adsorption phenomena typical of activated carbon are reviewed. The relative extent of anion and cation uptake is determined by means of the 'double tracer technique' and as a function of pH. Small columns are preequilibrated with the electrotype solutions. A solution of the same composition but which contains the appropriate tracer is then passed through the column bed and the effluent is monitored for appearance of the tracer. If the kinetics of exchange is satisfactory, a typical, symmetrical breakthrough curve is obtained. The greater part of the study made use of either commercial, powdered activated carbon Aqua Nuchar A or of a granular coconut charcoal. Most analyses were made radiometrically with appropriate gamma emitting isotopes or by standard atomic methods. Alkali metal separations demonstrated cation exchange properties found at high pH and to a certain extent in neutral solutions of activated carbons. Secondly, the uptake of electrolytes from neutral and slightly acidic solutions was illustrated. A distinction was made between cases where the cation was a metal and where it was the hydrogen ion. Adsorption and separation methods made possible at high ionic strength were examined. Finally, experiments were reviewed where activated carbon is modified by the adsorption of organic acids and by the incorporation of hydrous oxides. (Waltner-FIRL)
W76-01748

TECHNOLOGY AND $20 BILLION ADVANCE WASTEWATER EFFORT.
Engineering News Record, Vol 195, No 13, p 18-31, October 1975.

Descriptors: *Waste water treatment, *Tertiary treatment, Treatment facilities, Costs, Government finance, Sludge disposal, Capital costs.

The construction of advanced water treatment (AWT) facilities to combat water pollution is estimated at two billion. The major impediment is cost. The research budget for AWT has been cut back in recent years; EPA's research allocations are mostly spent on already existing plants and processes. The National Commission on Water Quality's final report on costs and benefits will be released in March and is expected to greatly influence the development of the AWT market. In addition, there is hesitation on the part of municipalities and industries. Some feel that secondary projects not yet put into effect should be given precedence over AWT. Some recommend further research before the project is undertaken but caution against too long a delay. Others want to reexamine the need for AWT at all. Moderate views support the installation of AWT plants where secondary treatment is inadequate. The many processes available to remove remaining pollutants of secondary effluents are reviewed. The largest portion of the AWT research budget is devoted to the problem of sludge disposal. More than forty percent of the capital cost of a treatment plant is utilized in sludge handling. While the United States is more advanced than other countries in AWT technology, Israel, Germany and the USSR all have AWT research or plants. AWT activity is growing in Japan, and Sweden is starting a full-size program. (Waltner-FIRL)
W76-01749

REHABILITATION OF A RECREATIONAL LAKE THROUGH AREAWIDE SEWERAGE.
Public Works, Vol 106, No 10, p 98-99, October 1975.

Descriptors: *Sewerage, *Waste water treatment, *Treatment facilities, Lakes, Rivers, Water quality control, Septic tanks, *Wisconsin, Sewer systems.
Identifiers: Gravity sewers, Lake Koshkonog(Wis), *Lake rehabilitation.

In 1970, a waste water collection system and treatment facilities for sewage from four townships around Lake Koshkonog, Wisconsin, were proposed to replace the existing septic tank systems. The lake shore soil conditions did not favor the continued use of septic tanks, and the construction of areawide sewerage was viewed as a solution to the deterioration of the lake water quality. A sanitary district was organized, and facilities to accomodate 5500 connections were designed. The collection system for the waste water was complicated by having to follow one-third of the lake shore and part of the Rock River, necessitating providing 125,000 linear feet of 8-inch to 24-inch gravity sewers and 25,000 feet of force mains. Treatment for the collected water was provided by the concentration of wastes to a single discharge point. An aerated lagoon system was used, consisting of three lagoons, each with a surface area of 2.3 acres. Their combined capacity was 18 million gallons, at a flow rate of 600,000 gpd. The lagoons operate in series, and retention at the design flow is about 30 days. BOD loading was estimated to be 1020 pounds per day. Monitoring and laboratory testing at the lagoons has been implemented and routine duties include checking blower operation, reading meters, recording pressures and waste water flow and chlorine use, collecting samples and performing laboratory tests for BOD, DO, suspended solids, pH, and chlorine residual. The facility has been in operation since August 1973. While no analytical measurement of the lake and river quality have been made since the sewerage system was installed, improvement has been noticeable in terms of reduced weed growth and odor. (Kramer-FIRL)
W76-01750

ENTERIC VIRUS BEHAVIOR IN SAND DUNES,
Technion Israel Inst. of Tech., Haifa. Environmental Engineering Lab.
E. Lefler, and Y. Kott.
Israel Journal of Technology, Vol 12, No 5/6, p 298-304, 1974, 3 fig, 6 tab, 17 ref.

Descriptors: *Water reuse, *Waste water treatment, Recharge, Viruses, Public health, Laboratory tests, Groundwater, Infiltration, Ions, Analytical techniques.
Identifiers: Sand dunes, Sewage reclamation, Israel.

One step in a method of waste water treatment in the planned Dan, Israel, sewage reclamation project is to infiltrate the water through sand dunes and pump the recharged water after a lag period of 400 to 800 days. Very little laboratory data exists on the investigation of groundwater viral pollution, and the possibilities of public health problems from waste water reuse. This laboratory study was conducted to obtain a better understanding about the relationship between viruses and the infiltration area for future sewage reclamation projects. To investigate enteric virus behavior in sand dunes, bacteriophage f2 and attenuated poliovirus 1 were used as experimental viruses. Particles of these were introduced into sand columns 4 x 10 cm. The influence of various cation concentrations were examined for virus retention. No increase of eluted polioviruses were seen in batch experiments, using several eluents with different pH values. While 95% of the retained viruses were released in the first four washes, the sand still contained poliovirus particles after ten successive washings. Experiments with ions indicated that only bivalent cations (which exist in effective concentrations in tap water) such as Ca^{++} and Mg^{++} may be responsible for virus retention in sand. This should be considered in planning waste water reuse through infiltration through sand dunes, to prevent seasonal virus breakthrough into the groundwater due to rains which have very low ion concentrations. (Kramer-FIRL)
W76-01755

LABORATORY STUDIES CONCERNING THE INFLUENCE OF THE TYPE OF ENERGY DISSIPATION ON THE AGGREGATION PROCESS (LABORUNTER-SUCHUNGEN UEBER DEN EINFLUSS DER ART DES ENERGINEEINTRAGES AUF DEN FLOCKUNGSVORGANG),
R. Klute, and H. H. Hahn.

Vom Wasser, Vol 43, p 215-235, 1974. 7 fig, 2 tab, 21 ref.

Descriptors: *Flocculation, *Coagulation, Mixing, Laboratory tests, Turbidity, Flow characteristics, Analytical techniques, *Waste water treatment.
Identifiers: Floc properties, Colloidal characteristics.

A description of the flocculation and coagulation processes in turbulent flow is presented. Because current systems require short reaction times and a diversity of coagulants are used, the effects of energy dissipation of the destabilization and transport phases is important. This study investigated where the distribution of velocity gradients in the reaction chamber was significant, and would therefore invalidate the concept of an average linear velocity gradient. Two different clay suspensions were coagulated with Na+, Ca2+, and Hercofloc at a constant pH. In a jar test, turbine, propeller-type and anker-type stirrers were used; all three stirrers required the same energy input in the region of investigated speed. However, the coagulation rates for the stirrers were found to be different, contradicting the premise of an average linear velocity gradient. The anker-type stirrer provided the most uniform distribution of the turbulence. This is dependent upon floc properties, determined by the colloidal characteristics and the coagulant. It was concluded that the distribution of turbulence created by different stirrers in a reaction chamber is an important parameter to be considered. (Kramer-FIRL)
W76-01759

THE EFFECT OF OZONE ON THE DISSOLVED ORGANIC SUBSTANCES IN THE WATER OF LAKE CONSTANCE (WIRKUNG VON OZON AUF DIE GELOESTEN ORGANISCHEN SUBSTANZEN IM BODENSEEWASSER),
For primary bibliographic entry see Field 5C.
W76-01760

MILILANI TOWN WASTEWATER RECLAMATION AND RECYCLING PROJECT,
Hawaii Univ., Honolulu. School of Public Health.
N. C. Burbank, Jr.
Journal of the American Water Works Association, Vol 67, No 9, p 487-489, September, 1975. 1 fig, 3 tab, 18 ref.

Descriptors: *Waste water treatment, *Reclamation, *Recycling, Groundwater, Pollutant identification, Irrigation, Biochemical oxidation demand, Chemical oxidation demand, Population, Sewage effluents, Sewage treatment, Viruses, Virucide, DDT, Chlorinated hydrocarbon pesticides, Phenols, *Hawaii.
Identifiers: Mililani Town(Haw), Infrared spectra, Carbon chloroform extract, Virucide bromine chloride.

It has been estimated that Hawaii, which is served almost solely by groundwater supplies, had sufficient water until the year 2020. However, recent population and water use increases have outstripped these estimates. Four years ago a study of the reclamation and recylcing of sewage waters for irrigation was started. A reevaluation of this study and a review of carbon chloroform extract (CCE) data is discussed. At the beginning of the study CCE concentrations for rural, agricultural and wildlife areas indicated excellent water quality. DDT and other chlorinated hydrocarbons, indicated in other studies, were not found in detectable amounts. Infrared spectra of organic extracts were too complicated to be analyzed, but they did indicate the possible presence of phenols. Biochemical oxidation demand and chemical oxidation demand were used as indirect measurements of the amount of organic matter, but now direct destruction of carbon in the infrared detection total carbon oxidation unit can give a more direct measurement. Studies were performed at Mililani Town, Hawaii, on the feasibility of using sewage plant effluent for irrigation. To kill enteric viruses effectively very large amounts of chlorine are needed. Studies on an alternative material, virucide bromin chloride, are suggested. It was also found that data on CCE from sewage are scarce. (Pinto-FIRL)
W76-01764

WATER RENOVATION USING DEEP NATURAL SAND BEDS,
Rensselaer Polytechnic Inst., Troy, N.Y.
. Hajas, N. L. Clesceri, J. Tofflemire, S. Beyer, and L. Hajas.
Journal of the American Water Works Association, Vol 67, No 9, p 510-515, September, 1975. 5 fig, 2 tab, 9 ref.

Descriptors: *Waste water treatment, *Sewage treatment, Infiltration, Flood plains, Effluents, Aerobic conditions, Pollutant identification, Groundwater, Nitrogen, Phosphorus, Treatment facilities, New York.
Identifiers: *Lake George(NY).

Waste water purified by the Lake George Village sewage treatment plant in New York was tested in order to determine whether the final effluent is being safely treated for its ultimate discharge into Lake George. Seepage from the banks of the flood plain of West Brook, which ultimately flow into the lake, was analyzed, and aerobic conditions were found in the groundwater between the treatment plant and West Brook. Samples taken from several wells and other locations were analyzed for temperature, dissolved oxygen, dissolved solids, pH, soluble phosphorus, N03-N, NH3-N, coliforms and chlorides. These samples were made during each season, because the Lake George area has a seasonal increase in population due to summer tourism and a heavy runoff from spring snow melt. It was found that chloride were not diminshed, phosphorus was completely removed, and a nitrified effluent was produced which appears to have no obvious negative effects upon the Lake George water quality. Thus, effluent polishing using infiltration beds does achieve a sufficient degree of purification. (Kramer-FIRL)
W76-01765

THE EFFECTS OF OZONE DEODORIZATION EQUIPMENT FOR THE SEWAGE ODOR (GESUI SHUKI NI TAISURU OZON DASSHUSOCHI NO KOKA),
K. Nishida, T. Honda, and T. Tsuji.
Akushu no Kenkyu, (Odor Control Association Journal), Vol 4, No 20, p 24-30, May, 1975. 5 tab, 11 ref.

Descriptors: *Ozone, *Sewage, *Odor, *Waste water treatment, Sewage treatment, Equipment, Gas chromatography, Photometry, Treatment facilities, Analytical techniques, Measurement, Hydrogen sulfide, Ammonia.

The effectiveness of ozone deodorization equipment for eliminating sewage odors was determined. The concentrations of odor-causing compounds at a sewage treatment plant in Osada, Japan, were measured before and after ozone treatment. The plant in Osaka, Japan, were measured before and after ozone treatment. The plant treated 4000 to 10,000 cu m gas per hr in an ozone reaction bath. The rate of ozone injected into the bath was 150 g/hr. The gas samples before and after the treatment were collected and analyzed by gas chromatography using a flame photometry detector and a PEG 20 M column. The ozone concentration injected into the bath was 1530 to 1710 ppm and the ozone level in the treated gas was 0.13 ppm. The residual ozone was treated at another bath, lowering the ozone concentration to below 0.01 ppm before the final discharge into the air. A gas chromatogram showed 12 peaks, indicating concentrations in the untreated gas of methyl mercaptan, 16.9 ppm; dimethyl sulfide, 1.30 ppm; hydrogen sulfide, 0.30 ppm; ammonia, 0.0052 ppm; trimethyl amine, less than 0.0005 ppm; n-propyl mercaptan, 31.3 ppm; and n-amyl mercaptan, 4.75 ppm. The concentrations of the corresponding compounds in treated gas were: 12.6 to 12.8 ppm; 0.72 to 1.12 ppm; 0.29 to 0.0098 ppm; 0.0026 to 0.0047 ppm; less than 0.0005 ppm; less than 0.01 ppm; and 1.64 to 4.20 ppm. Thus, ozone removal efficiencies were 24.3 to 25.5% for methyl mercaptan; 13.9 to 44.6% for dimethyl sulfide; 3.4 to 96.8% for hydrogen sulfide; 9.7 to 30.8% for ammonia; better than 99.9% for n-propyl mercaptan; and 11.6 to 65.5% for n-amyl mercaptan. (Katayama-FIRL)
W76-01771

WASTEWATER SAMPLE PRESERVATION,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5A.
W76-01772

OPTIMIZATION OF FILTRATION FOR SURFACE WATER TREATMENT (OPTIMIERUNG DER FILTRATION BEI DER OBERFLAECHENWASSERAUF-BEREITUNG),
M. Kavanaugh.
Vom Wasser, Vol 43, p 53-71, 1974. 8 fig, 12 ref.

Descriptors: *Model studies, *Filtration, *Laboratory tests, Polyelectrolytes, Filters, Surface waters, *Waste water treatment.
Identifiers: Particulate collection, Head loss buildup.

A simple model of particulate collection and headloss buildup in granular media filtration has been developed. Assumptions made in design of this model were substantiated through filtration experiments conducted in small laboratory columns (ID = 10 cm) using glass beads as media and latex microspheres as model colloids. One application of the model was illustrated by a hypothetical design problem for contact filter treating a clay suspension destabilized with a cationic polyelectrolyte. By using pilot plant scale tests, the model should be useful in estimating optimum process conditions for a given filtration problem. (Kramer-FIRL)
W76-01775

REPRESENTATION OF MACROSCOPIC FLOW IN AN AERATION BASIN BY A CASCADE FORMED BY TWO UNEQUAL PERFECT MIXERS (REPRESENTATION DE L'ECOULEMENT MACROSCOPIC DANS UN BASSIN D'AERATION PAR UNE CASCADE DE DEUZ MELANGEURS PARFAITS INEGAUX),
Montpellier-2 Univ., (France). Laboratoire de Genie Chimique.
S. Elmaleh, and R. Ben Aim.
The Chemical Engineering Journal, Vol 9, No 2, p 107-114, April, 1975. 10 fig, 1 tab, 7 ref.

Descriptors: *Aeration, *Model studies, Mathematical models, Mixing, Flow measurement, Oxidation lagoons.
Identifiers: *Aeration tanks, Retention time distribution.

Few investigations have been conducted on the mixing in an aeration tank, and either perfect mixing or plug flow has generally been assumed. In this study, the Retention Time Distribution (RTD) was determined in a 12 cu cm tank aerated by coarse bubble diffusers. Mixing was independent of liquid flow in the test range but increased with air flow. The RTD curves were interpreted by a model of two unequal perfectly stirred reactors. Experimental curves were fitted to the model with peak time. Thus, the model parameter was linked to air flow and agreement between experimental and theoretical curves was determined to be good. (Kramer-FIRL)
W76-01778

FACILITIES PLANS: CLEARING UP THE CONFUSION,
For primary bibliographic entry see Field 5G.
W76-01782

EPA MONEY PROPOSALS CAUSE CONCERN,
Passiac Valley Sewerage Commission, Newark, N.J.
For primary bibliographic entry see Field 5G.
W76-01783

CLEAN WATER WILL COST $159 BILLION.
For primary bibliographic entry see Field 5G.
W76-01784

EPA COMPLETES NEW PLANT AND SEWER INDEX DATA SERIES.
For primary bibliographic entry see Field 5G.
W76-01785

ASBESTOS AND CHLORINATED ORGANICS TOP AWWA DISCUSSIONS,
For primary bibliographic entry see Field 5F.
W76-01786

ORGANICS, WATER, AND HEALTH: A REUSE PROBLEM,
California State Dept. of Health, Los Angeles. Water Sanitation Section.
A. W. Reinhardt, D. P. Spath, and W. F. Jopling.
Journal of the American Water Works Association, Vol 67, No 9, p 477-480, September, 1975.

Descriptors: *Water reuse, *Organic matter, *Waste disposal, Waste water treatment, Water supply, California, Public health, Recycling, Recharge, Groundwater, Water resources development, Organic wastes.
Identifiers: Reclaimed waste water.

The use of reclaimed waste water for augmenting domestic water sources is discussed as a major cause for health concern due to effects of stable organic material in the waste water. While reclaimed waste water has been used for crop irrigation of crops with little public contact, the usage has been expanded to include public areas. The last use of reclaimed water has been direct discharge for supply augmentation into a domestic water system or storage facility. The California State Department of Health strongly recommends against the continued use of recharge operations which increase the stable organic loadings of groundwater used for domestic supply. The health effects of such organic materials remain unknown and research is as yet in a preliminary stage. Plans for new spreading and injecting facilities, including the Anaheim Forebay Reclamation Project and the Los Angeles Water Recycling Project, are under review. (Kramer-FIRL)
W76-01789

GOVERNMENT DOLLARS TO FUEL 18% GROWTH IN 1976 SEWERAGE MARKET.
For primary bibliographic entry see Field 5G.
W76-01794

ALARM SYSTEMS PROVIDE LOW COST ENVIRONMENTAL PROTECTION,
Beavin Co., Baltimore, Md.
C. E. Walter.
Public Works, Vol 106, No 10, p 88-89, 112, October, 1975.

Descriptors: *Automation, *Treatment facilities, *Waste water treatment, *Pollutant identification, Equipment, *Monitoring, Installation, Control systems, Costs.
Identifiers: *Alarm systems, System malfunction, Automatic telephone dialer.

The use of automated alarm systems for waste water treatment plants and pumping stations is discussed. To be effective, these malfunction alarms must attract human attention and must generate a response. It is recommended that the alarms be designed to transmit a signal to a remote location which is manned 24 hours a day so that the alarm will receive immediate attention. The types of failures or malfunction that can be detected include power failure, high water, loss of air in an activated sludge plant, excessive turbidity, excessive sludge accumulation, pump or motor failure, primary tank malfunction, high or low chlorine residual, or chlorine gas leaks. The Mount Airy, Maryland, treatment plant is cited as an example where the alarm system has been custom designed and fabricated. A less sophisticated equipment may be used to monitor a small treatment plant, adapting standard burglar alarm components. Receivers of an alarm signal can be placed in a police or fire station so that when a failure alarm is signaled, the appropriate plant operator will be contacted. Another type of burglar alarm system is an automatic telephone dialer, which is activated by the alarm system controller to automatically call as many as four different telephone numbers, sending the recorded message to each. Costs of basic detectors, control unit, and telephone dialer were estimated to be $500 per plant; installation costs should not exceed $500. (Kramer-FIRL)
W76-01795

THE USE OF WASTE HEAT IN A SYSTEM FOR ANIMAL WASTE CONVERSION WITH BY-PRODUCT RECOVERY AND RECYCLING,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. E. Boersma, W. R. Barlow, J. R. Miner, H. K. Phinney, and J. E. Oldfield.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 555, $4.00 in paper copy, $2.25 in microfiche. Oregon Water Resources Research Institution, Corvallis, Report WRRI-38, October 1975. 33 p, 4 fig, 15 tab, 35 ref. OWRT B-039-ORE(3). 14-31-0001-4121.

Descriptors: *Recycling, *Byproducts, Natural resources, *Waste treatment, Algae, Microorganisms, Cultures.
Identifiers: Non-renewable natural resources, Photoautrophic algae, *Waste heat, *Animal waste conversion.

Society faces many problems related to its growth in numbers and standard of living. Of major concern are the consumptive use of non-renewable natural resources and the environmental degradation resulting from pollution. An animal waste management scheme was developed on the premise that one solution to these problems is the development of integrated production systems with recycled resources. It is proposed to use microorganisms to convert animal waste into a high protein animal feed and a methane-rich fuel gas. A conceptual design for such a system is described and results are presented of preliminary experiments conducted in the laboratory. It was decided to use photoautrophic algae for nutrient recovery. Data are presented which demonstrate that based on its mineral composition swine manure is a suitable medium for algal growth. The most encouraging aspect of the laboratory studies has been the stability of the cultures. The average growth rate at 37C during a 12 hour period with a retention time of 3.3 days and a culture depth of 10 cm was about 22 g/m2/day. The consistently high yields of cell dry matter and protein has been encouraging.
W76-01806

PREDICTING THE PERFORMANCE OF FEEDLOT CONTROL FACILITIES AT SPECIFIC OREGON LOCATIONS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W76-01807

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE LEATHER TANNING AND FINISHING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
J. D. Gallup.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 079, $6.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-016-a, Contract No 68-01-0594, March, 1974. 166 p, 6 fig, 70 ref, 24 tab.

Descriptors: *Tannery wastes, *Waste water treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Waste treatment, Water pollution treatment, Standards, Economics, Effluents, Regulation.
Identifiers: *Leather industry.

This document presents the findings of an extensive study of the leather tanning and finishing industry for the purpose of developing effluent limitation guidelines. The guidelines set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the degree of effluent reduction attainable through the application of the best available technology economically achievable; these levels of treatment must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. Supporting data and rationale for the development of the proposed effluent limitation guidelines and standards of performance are presented. Manufacturing processes, wastes, and waste treatment methods and their costs are discussed. (Witt-IPC)
W76-01816

CARBON, NITROGEN, AND PHOSPHORUS REMOVAL IN STAGED NITRIFICATION-DENITRIFICATION TREATMENT,
District of Columbia Dept. of Environmental Services, Washington. EPA-DC Pilot Plant.
J. A. Heidman, D. F. Bishop, and J. B. Stamberg.
Environmental Protection Agency, Report EPA-670/2-75-052, June 1975. 37 p, 12 fig, 11 tab, 5 ref. 1BB043; ROAP 21-ASO; Task 017. 68-01-0162.

Descriptors: *Nitrification, Carbon, *Sewage treatment, Aeration, Nitrogen, Phosphates, *Activated sludge, Oxides, Sulfates, *Anaerobic conditions, Iron, Chlorides, Oxygen, *Filtration, *Waste water treatment, Dissolved gases, District of Columbia.
Identifiers: *Denitrification, EPA-DC Pilot Plant(Washington DC).

A three-stage activated sludge system with mineral addition for nutrient removal was operated with District of Columbia primary effluent. Influent flow followed a programmed diurnal cycle and averaged 205 cu m/day (54,000 gpd). The first biological reactor was operated as a modified aeration system with ferric chloride addition for supplemental phosphorus removal. The clarified effluent then flowed to the second reactor for the biological nitrification of ammonia and organic nitrogen. Dry lime was used for pH control. Methanol was added to the nitrified effluent, and biological denitrification occurred in the final activated sludge system. Prior to clarification, the denitrification effluent was briefly aerated for nitrogen gas removal and for consumption of any excess methanol. The clarified effluent was then split into two equal streams for comparison of filtration performance of a dual-media coal and sand filter with that of a multi-media coal, sand, and ilmenite filter. Effluent quality consistently met the proposed D.C. discharge standards of BOD less

than or equal to 4.5 mg/l; total N less than or equal to 2.5 mg/l; and P less than or equal to 0.22 mg/l. (EPA)
W76-01865

SINGLE STAGE NITRIFICATION-DENITRIFICATION,
District of Columbia Dept. of Environmental Services, Washington. EPA-DC Pilot Plant.
D. F. Bishop, J. A. Heidman, and J. B. Stamberg.
Environmental Protection Agency, Report EPA-670/2-75-051, June 1975. 28 p, 5 fig, 8 tab, 15 ref. 1BB043; ROAP 21-ASO; Task 026. 68-01-0162.

Descriptors: *Nitrification, *Activated sludge, *Waste water treatment, *Aeration, *Anaerobic conditions, Dissolved gases, *Sewage treatment, Oxygen.
Identifiers: Nitrogen removal, *Denitrification, On-off aeration, Single stage, Nitrification-denitrification, EPA-DC Pilot Plant(Washington DC).

The removal of 75-84% of the nitrogen from primary wastewaters was achieved in a single stage activated sludge process. The two-pass reactor was operated with a food to mass ratio (F/M) of approximately 0.1 gm BOD5/day/gm MLVSS. The air was applied on a 30-minute cycle first to one reactor pass then to the other pass. Mechanical mixers suspended the mixed liquor solids when the air was not applied. The D.O. concentration varied from 0.0 mg/l without air to 2-3 mg/l during aeration. In June with a 9-hour detention time in the reactor, the residual pollutant concentrations averaged 23 mg/l of COD (90% removal), 3.8 mg/l of total nitrogen (84% removal) and 7.8 mg/l of suspended solids (93% removal). In February, with a 12-hour reactor detention time, the residual pollutants averaged 25 mg/l of COD (89% removal), 6.0 mg/l of Total N (75% removal) and 14 mg/l of suspended solids (87% removal). Since the nitrate from nitrification was used to remove BOD5 from the wastewater, the process advantages for single stage nitrification-denitrification included the reduction in the amount of air needed to achieve BOD5 removal and nitrification; the minimizing of supplemental organic carbon sources for denitrification; and the elimination of clarifiers in staged nitrification-denitrification. (EPA)
W76-01866

REMOVAL OF CHROMIUM FROM PLATING RINSE WATER USING ACTIVATED CARBON,
Battelle, Columbus Lab., Ohio.
R. B. Landrigan, and J. B. Hallowell.
Environmental Protection Agency, Report EPA-670/2-75-055, June 1975. 43 p, 10 fig, 6 tab. 1BB036 (ROAP 21AZO, Task 17). S-802113.

Descriptors: *Activated carbon, *Activated carbon, Adsorbents, *Adsorption, Industrial wastes, *Waste water treatment, *Chromium.
Identifiers: Rinse water, Waste recovery, Metal finishing, Electroplating.

Chromium is a major pollutant in wastewaters from some electroplating operations. It can be effectively removed from rinse waters by adsorption on activated carbon, which must be regenerated when saturated with chromium to its upper limit. This study was concerned with the best means of regenerating the carbon under conditions which would return it as closely as possible to its original adsorptive capacity. The tests were conducted (1) on a laboratory scale to determine the effects of basic and acidic media on regeneration of chromium-loaded activated carbon and (2) in a small pilot plant unit on the basis of the best results of the laboratory-scale work. In the latter case, tests were conducted on the unit operation for eight adsorption-desorption cycles. The overall results suggest that a chromium removal unit could be installed in many of the small plating plants, relieving the burden on municipal sewage systems, and bringing the plating plant into compliance with local and Federal regulations. Recommendations for improvement of the regeneration process are given even though the process could be used in its present stage of development. (EPA)
W76-01867

METHODS TO TREAT, CONTROL AND MONITOR SPILLED HAZARDOUS MATERIALS,
Calspan Corp., Buffalo, N.Y.
For primary bibliographic entry see Field 5G.
W76-01869

MULTI-PURPOSE COMBINED SEWER OVERFLOW TREATMENT FACILITY, MOUNT CLEMENS, MICHIGAN,
V. U. Mahida, and F. J. DeDecker.
Environmental Protection Agency, Report EPA-670/2-75-010, May 1975. 204 p, 45 fig, 19 tab, 24 ref, 3 append. 1BB034; ROAP 21-ASY; TASK 149. 11023 FAR.

Descriptors: Cost comparison, Water quality, *Filtration, Sewers, *Chlorine, Surface runoff, *Water supply, Water conservation, *Overflows, Recreational facilities, Standards, Storage, *Disinfection, *Chlorination, *Combined sewers, *Waste water treatment, Treatment facilities.
Identifiers: *Microstraining, *Combined sewer overflow, *Storm runoff, Urban water management, Multi-purpose treatment, Clemens(Michigan), Stormwater reuse.

Combined sewer overflows from 212 acres within the City of Mount Clemens were conveyed to a treatment-park site. The overflows received initial treatment (settling and surface aeration) in a retention basin. Further treatment consisted of microstraining disinfection, surface aeration in a series of lakelets, and filtration. The annual existing overflow of 2180 cu ft/acre-inch of rainfall had SS of 50 lbs/acre-inch and BOD5 of 20 lbs/acre-inch. Treatment reduced the annual pollution load by 90 percent. The final lake sampling data had demonstrated that all water quality parameters for fishing, boating, and/or lawn sprinkling--except the toxic and deleterious substances parameters, which were not studied--were met. Very limited investigations were undertaken in the area of recreation, open space, and transitional land use. Treatment of combined sewer overflows was more cost-effective than separation of an existing combined sewer system. (EPA)
W76-01874

GUIDELINES FOR THE DISPOSAL OF SMALL QUANTITIES OF UNUSED PESTICIDES,
Midwest Research Inst., Kansas City, Mo.
E. W. Lawless, T. L. Ferguson, and A. F. Meiners.
Environmental Protection Agency, Report EPA-670/2-75-057, June 1975. 330 p, 4 fig, 12 tab, 166 ref, 5 append. 1BB041; ROAP 21AVO; Task 002. 68-01-0098.

Descriptors: *Pesticides, *Herbicides, *Insecticides, Waste treatment, Waste disposal, Incineration, Neutralization, Oxidation, Reduction(Chemical), Degradation(Decomposition), Water pollution treatment.
Identifiers: Pesticide spills, Pesticide manuals, Pesticide disposal.

Information has been compiled and organized that will be useful to responsible authorities in advising the layman (particularly the homehowner and small farmer) how to dispose properly of small amounts of surplus and unwanted pesticides and pesticide containers, and in treating pesticide spills. The report brings together available information on pesticide disposal methods and on over 550 individual pesticides, and evaluates this information in terms of the experience and equipment that the average layman has. Fourteen pesticide disposal procedures are described and procedures for disposal of containers and cleanup and treatment of spills are included. Preferred and alternate disposal procedures are recommended for over 550 pesticides. Included are a cross-index of over 1,600 pesticide names, tables showing the chemical composition and properties pertinent to disposal of the selected pesticides and bibliography of 166 references. (EPA)
W76-01875

TREATMENT AND ULTIMATE DISPOSAL OF CATTLE FEEDLOT WASTES,
Kansas State Univ., Manhattan.
H. L. Manges, R. I. Lipper, L. S. Murphy, W. L. Powers, and L. A. Schmid.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 185, $6.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-013, June 1975. 136 p, 44 fig, 26 tab, 78 ref. 1BB039. S800923.

Descriptors: Anaerobic conditions, *Waste disposal, Water pollution, Cattle, Rainfall, Soil chemistry, Soils, Fertilization, Groundwater, *Ultimate disposal, *Farm wastes, *Feed lots, Great Plains, Environment, *Waste treatment, Kansas.
Identifiers: Water pollutants.

A study was conducted to determine the characteristics of beef feedlot wastes, both runoff and manure, and the optimum application rate of these wastes to land. The project was located at a commercial beef feedlot in southcentral Kansas. Characteristics of beef feedlot wastes varied widely with season. Near maximum corn forage yields, without excessive accumulation of salt in the soil, were obtained from waste application rates necessary to meet nitrogen fertilizer recommendations. At these waste application rates, basic intake rate of water into the soil was increased. Net income from irrigated corn production was sufficient to make application of feedlot manure with disposal as the main objective unprofitable. Land application rates of beef feedlot wastes should be based upon the results of laboratory analyses of wastes from each feedlot. Feedlot wastes should be applied at rates necessary to meet nitrogen fertilizer recommendations. A salt-alkali test should be made annually on the surface soil to monitor changes in soil salinity levels. (EPA)
W76-01876

CONTROLLING SULFIDES IN SANITARY SEWERS USING AIR AND OXYGEN,
For primary bibliographic entry see Field 5G.
W76-01877

WATER QUALITY STANDARDS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PRODUCTIVE BUT UNREALISTIC,
For primary bibliographic entry see Field 5G.
W76-01959

5E. Ultimate Disposal Of Wastes

WASTE CONVERTER,
Standard Products Co., Cleveland, Ohio. (assignee).
H. W. Green, and O. F. Cook.
United States Patent 3,906,873. Issued September 23, 1975. Official Gazette of the United States Patent Office, Vol 938, No 4, p 1575, September, 1975. 1 fig.

Descriptors: *Patents, *Waste disposal, *Incineration, *Sewage disposal, Equipment, Waste disposal.

A method of sewage disposal has been patented. Equipment consists of a vaporizing chamber and means for discharging wastes downward into the chamber. Flaming combustion products are in-

troduced into the chamber at a rate sufficient to maintain a flame-filled condition within the chamber. A high proportion of the sewage products are thereby vaporized and consumed. Exhaust means are connected to the upper portion of the chamber, and separation equipment is located in the exhaust means to remove solids from the exhaust. (Kramer-FIRL)
W76-01539

SEWAGE TREATMENT SYSTEM INCLUDING EFFLUENT EVAPORATOR,
Coate Burial Vault, Inc., West Milton, Ohio. (assignee)
For primary bibliographic entry see Field 5D.
W76-01541

CHICAGO'S SYSTEM OF SLUDGE TRANSPORT TO LAND RECLAMATION SITES.
Public Works, Vol 106, No 8, p 72, August, 1975.

Descriptors: *Sludge disposal, *Lagoons, *Treatment facilities, Sludge treatment, Transportation, Recycling, Pumps, Waste water treatment, Illinois.
Identifiers: Land application, *Chicago(Ill).

Sludge removal from waste water treatment plants is being undertaken at two locations in the Chicago area. At the Lawndale Avenue lagoon facility, which serves as the storage area for sludge from the West-Southwest treatment works, sludge removal is handled directly by the Metropolitan Sanitary District of Greater Chicago. At the Calumet treatment works, the operation is being handled by private contractors. At each location, sludge is transferred from the lagoons to bulk carriers by submersible pumps placed directly in the lagoons. Sludge from Lawndale is discharged to barges on the adjacent Chicago Sanitary and Ship Canal, which will deliver it to a Fulton County site about 180 miles away. The dense sludge is moved to the barges by two Flygt CS-3300 pumps; mixers fluidize the sludge so that the concentration is under 8 percent. At the destination in Fulton County, each barge is unloaded by pumps and conveyed 11 miles for storage before land application. Sludge which has been stored in Calumet lagoons from 10 to 20 years is pumped out directly to railroad tank cars, each with a capacity of 20,000 gallons. The solids content of this sludge is more than 12 percent. A special rake blade traverses the lagoon and draws the sludge to the point of pumping at the lagoon edge. Four Flygt B-2250 submersible pumps are supported by a pier near the lagoon edge and hoses discharge to the tank cars through a pipeline 6700 feet long. Trains take the sludge daily to the Shawnee National Forest and to Arcola, Illinois, for disposal as fertilizer and soil conditioner. (Kramer-FIRL)
W76-01544

MIAMI PUSHES REGIONALIZATION TO KEEP PACE WITH POPULATION,
Miami-Dade Water and Sewer Authority, Fla.
For primary bibliographic entry see Field 5D.
W76-01546

SANITARY LANDFILLS: NO PLACE FOR LEACHING,
Richards of Rockford, Ill.
For primary bibliographic entry see Field 5D.
W76-01550

LAND DISPOSAL OF WASTEWATER IN HAWAII,
Hawaii Univ., Honolulu, Dept. of Civil Engineering.
G. L. Dugan, R. H. F. Young, S. L. Lau, P. C. Ekern, and P. C. S. Loh.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2067-2087, August, 1975. 4 fig, 8 tab, 11 ref.

Descriptors: *Waste disposal, *Irrigation, Drainage, Sugarcane, Grasslands, Nutrient removal, Viruses, Recycling, Effluents, *Hawaii.
Identifiers: *Waste reuse, Land application, Oahu(Hawaii), Enteric viruses, Total organic carbon.

Determination of the feasibility of applying secondary treated waste water effluent to selected land areas on the island of Oahu, Hawaii, is discussed. Grassland and sugarcane culture were irrigated with waste water effluent to ascertain the probable effects on groundwater quality, particularly in terms of dissolved solids and enteric virus transmission and survival. Also, the total sugar cane production and purity were determined for sugar cane cultured in test plots receiving waste water effluent. A combination of grass and soil removed almost all detectable amounts of nitrogen and phosphate from waste water effluent, and between 90 and 95 percent of TOC, suspended solids, and boron. Sugar cane fields showed the same general results. Human enteric viruses were found to have generally surfived secondary waste treatment. However, the soil was effective in removing the viruses from the secondary effluent. (Pinto-FIRL)
W76-01557

THE DEVELOPMENT OF A CENTER PIVOT WASTEWATER IRRIGATION MACHINE,
Metropolitan Sanitary District of Greater Chicago. Ill.
For primary bibliographic entry see Field 5D.
W76-01565

WATER QUALITY ASPECTS OF TANNERY EFFLUENTS DISPOSAL,
National Research Inst. for Shoe and Allied Industries, Gottwaldov (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W76-01645

ENVIRONMENTAL CONSIDERATIONS OF SANITARY LANDFILL SITES: PART I,
Dames and Moore, Los Angeles, Calif.
J. A. Fischer, and D. L. Woodford.
Public Works, Vol 104, No 6, p 93-97, 1973, 4 fig, 2 tab.

Descriptors: *Sites, *Landfills, Sanitary engineering, Geology, Environmental effects, Groundwater, Leachate, Hydrology, Biochemical oxygen demand, Chemical oxygen demand, Chlorides, Nitrates, Impervious soils, Topography, Climates, Rock properties, Aesthetics.

Proper selection of sanitary landfill sites should include knowledge of the mechanism of fill decomposition, the hydrologic cycle, geology, and ecological balances. Pollution of groundwater by leachate is probably the most important problem; the significant pollutants are usually biochemical oxygen demand, chemical oxygen demand, chloride, and nitrate. Site topography and soil conditions may cause erosion problems. Air pollution, control of disease vectors, possible disturbance of the ecological balance, noise, odors, and appearances must all be considered. Site selection should include evaluation of the type, elevation, and quality of the soil and rock; water levels; ground-and surface- water systems; and local occurrences and uses of water resources. Excellent sites should provide natural protection against pollution: thick deposits of relatively impermeable materials under the site, adequate quantity and quality of cover material, and favorable topographic, hydrologic and climatological features. Avaliable information about these factors should be reviewed, then borings made at the site to confirm these conditions. Piezometers should be installed during drilling operations to monitor water quality and flow conditions. (Buchanan-Davidson--Wisconsin)
W76-01649

PROCESS FOR TREATING SEWAGE SLUDGE,
For primary bibliographic entry see Field 5D.
W76-01730

SAND FILTER AND WASTE STABILIZATION POND TEST SHOWS POSSIBILITY FOR TREATMENT OF INDIVIDUAL WASTEWATER DISPOSAL,
Public Health Service, Grant, N. Mex. Div. of Indian Health.
For primary bibliographic entry see Field 5D.
W76-01738

THE USE OF WASTE HEAT IN A SYSTEM FOR ANIMAL WASTE CONVERSION WITH BY-PRODUCT RECOVERY AND RECYCLING,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W76-01806

DISPOSAL OF MARINE SEWAGE: AN ENVIRONMENTAL MANAGEMENT STANDARD FOR NAVAL SHIPS,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5G.
W76-01828

GUIDELINES FOR THE DISPOSAL OF SMALL QUANTITIES OF UNUSED PESTICIDES,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-01875

TREATMENT AND ULTIMATE DISPOSAL OF CATTLE FEEDLOT WASTES,
Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 5D.
W76-01876

TEST CASE ON OCEAN DUMPING: MUST PHILADELPHIA MOVE TOWARD ON-LAND DISPOSAL OF SEWAGE SLUDGE.
For primary bibliographic entry see Field 5G.
W76-01971

MARINE POLLUTION-PREVENTION-WASTES, ETC.
For primary bibliographic entry see Field 6E.
W76-01992

5F. Water Treatment and Quality Alteration

OPTIMAL PLANNING OF REGIONAL WASTEWATER SYSTEMS AND THEIR IMPACTS ON STREAM QUALITY WITH A CASE STUDY OF THE CARSON RIVER BASIN,
Nevada Univ., Reno. Dept. of Civil Engineering.
R. G. Orcutt, L. D. Bottoroff, and T. D. Chiatovich.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 092, $6.75 in paper copy, $2.25 in microfiche. Desert Research Institute, Reno, Center for Water Resources Research, Publication No EN-2, August 1975. 148 p, 14 fig, 10 tab, 71 ref, 4 append. OWRT B-061-NEV(1). 14-31-0001-3909.

Descriptors: *Model studies, *Waste water treatment, *Nevada, *Optimum development plans, *Regional analysis, Algorithms, Treatment facilities, River basin development.
Identifiers: Lake Tahoe, *Carson River Basin(Nev).

The problem of wastewater transportation, treatment, and utilization in the Carson River and Lake Tahoe Basins served as a basis for the develop-

ment of the methodologies presented. A general heuristic algorithm for determining near optimal regional wastewater facilities was derived. Dynamic programming was employed for the sub-optimization of interlinked wastewater transportation systems. The diurnal variation of dissolved oxygen due to photosynthesis was modeled. A regression relationship involvnig nutrients, flow, and temperature was used to estimate the magnitude of the photosynthesis component of the model. Possible future population growth patterns in the Carson Valley and the Nevada portion of Lake Tahoe were analyzed with the algorithm to determine the near optimal wastewater facilities to serve them. The impacts of these systems on dissolved oxygen levels in the Carson River were assessed with the simulation model. Sensitivity analysis of significant parameters was performed to achieve a better understanding of their significance in achieving a solution to the type of problem under consideration. (Fallon-Nevada)
W76-01524

A ROTARY APPARATUS FOR PURIFYING THE WATER BY ALTERNATELY CONTACTING THE SURFACE OF THE APPARATUS WITH AIR AND WATER,
N. H. Ahlgren.
Australian Patent 463,591. Issued July 31, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 27, p 3046, July, 1975.

Descriptors: *Water purification, *Water treatment, *Patents, Equipment, Aeration.
Identifiers: Rotary systems.

Rotary water treatment equipment has been patented. The system is closed except for entrance and exit openings, and includes means fro causing the apparatus to rotate. Contact surfaces for air and water are provided witnin the body of the apparatus, and are arranged so that water is advanced through the body and is purified. The rotary body has a buoyancy of its own and will rotate, supported by the water, and automatically adjust itself to the water level. (Kramer-FIRL)
W76-01538

DEFLUORIDATION OF WATER BY NALGONDA TECHNIQUE,
National Environmental Engineering Research Inst., Nagpur (India).
W. G. Nawlakhe, D. N. Kulkarni, B. N. Pathak, and K. R. Bulusu.
Indian Journal of Environmental Health, Vol 17, No 1, p 26-65, January, 1975. 8 fig, 22 tab, 21 ref.

Descriptors: *Potable water, *Water treatment, *Fluorides, Pilot plants, Laboratory tests, Analytical techniques, Operating costs, Economics.
Identifiers: *Defluoridation, *India, *Chemical treatment, *Nalgonda technique.

A technique to remove excess fluorides from drinking water has been developed in India. The proposed method, called the 'Nalgonda Technique', consists of the addition in sequence of sodium aluminate or lime, bleaching powder and filter alum to the fluoride water, followed by flocculation, sedimentation, and filtration. The method was investigated under laboratory conditions and then tested in the field. Such field studies included experiments in buckets and in drums (batch type) as well as in pilot plants (continuous type). The technique was seen to be effective in producing a clear water, with fluoride within permissible limits. The precise mechanism of fluoride removal was not understood, and it was due neither to adsorption nor to coprecipitation. The technique is adaptable to community water supplies, and the costs for defluoridation of water for individuals or communities is low enough so as to be feasible. (Kramer-FIRL)
W76-01543

PROGRESS WITH THE DECARBONIZATION PROCESSES (FORTSCHRITTE IN DER VERFAHRENSTECHNIK DER ENTCARBONISIERUNG),
R. Flunkert, H. Pietzner, and A. Schiffers.
Vom Wasser, Vol 43, p 467-494, 1974. 20 fig, 2 tab, 10 ref.

Descriptors: *Calcium carbonate, *Water treatment, Potable water, Water softening, Equipment, Efficiency, Industrial water.
Identifiers: *Decarbonization.

Advances in chemical and engineering technology have permitted the optimization of rapid decarbonization reactors. Practical experience with full-scale trials have confirmed the results of laboratory studies. Several interesting solutions, in terms of economics, have been identified. Rapid decarbonization is sometimes difficult to achieve. This has an adverse effect on optimum operation of the processes because of the sludgy characteristics of the precipitated carbonate of calcium. Mineralogic research has shown that the crystalline structure of calcium carbonate is very important. It is concluded that there are limits to large-scale rapid decarbonization. (Orr-FIRL)
W76-01545

THE CONSTANCE DRINKING WATER TREATMENT STATION-MODEL STUDIES AND OPERATING EXPERIENCES (DIE KONSTANZER TRINKWASSERAUFBEREITUNG-MODELLUNTERSUCHUNGEN UND BETRIEBSERFAHRUNGEN),
R. Barth, H. Lehn, and J. Mauz.
Vom Wasser, Vol 43, p 117-125, 1974. 4 fig, 2 tab, 6 ref.

Descriptors: *Water treatment, *Water purification, *Filtration, *Ozone, Filters, Foreign research, Potable water, Water supply, Europe.
Identifiers: Microfilters, Sand filters, Lake of Constance.

A new system for potable water purification was necessitated by the increasing amount of plankton in the depth of 40-50 meters of the Lake of Constance. The system consists of a rotating microfilter, the addition of unpressurized ozone, and a sand filter. The rate of filtration is 10 m/hr. This system was effective in laboratory tests performed from 1964 to 1966 and in a plant situation from 1968. A tissue of steel-threads, containing 230 holes per sq mm, is stretched over the microfilter. The holes form triangles, and within each triangle is a circle with a 23 mm radius. The zooplankton, most of the phytoplankton, and some bacteria are caught by the tissue. Two percent of the purified water is used to rinse the microfilter. This rinsing brings 90% of the raw-mass into the sewage canal. The remaining small plankton and bacteris are oxidized by ozone. The sand filter can be operated for long periods without cleaning. Cleaning uses 3.0% of the purified water and is performed about every six weeks. The small amount of purified water required for rinsing the microfilter and sand filter eliminates a large drain on the water supply. (Orr-FIRL)
W76-01547

EXPERIENCES WITH DRY FILTRATION OF WATER IN THE NORTH GERMAN LOW LAND (ERFAHRUNGEN MIT DER TROCKENFILTRATION VOL WAESSERN DER NORDDEUTSCHEN TIEFEBEBE),
H. W. Braeuer.
Vom Wasser, Vol 43, p 237-245, 1974. 4 fig, 1 ref.

Descriptors: *Filtration, *Water Treatment, *Filters, Water works, Pilot plants, Foreign research, Efficiencies.
Identifiers: *Dry filters, *Germany.

Dry filtration is described and the raw water supply in Northern Germany is characterized. Operating experiences with dry filters used in 7 water works and 14 pilot plants are discussed. The high solids-holding capacity, and the efficient filtration that can be achieved by employing dry filtration is demonstrated. The performance of these filters after backwashing, and the various operational applications are also discussed. (Orr-FIRL)
W76-01548

BIN ACTIVATOR HELPS UPGRADE WATER PURIFICATION OPERATION.
Water and Sewage Works, Vol 122, No 8, p 68, August, 1975. 1 fig.

Descriptors: *Water treatment, *Lime, *Equipment, Automation, Water purification, Mechanical equipment, Installation, Flow.
Identifiers: Vibra Screw Bin Activator.

An automated system designed to discharge pebble lime from storage to a 10 mgd water purification process was installed in 1974 in the Kankakee Water Company's plant in Kankakee, Illinois. The automated system has reduced labor costs, provided additional storage space in the chemical building, and upgraded the general cleanliness of the facility. The system used pebble lime stored in a wide bin, remote from the chemical building. A five foot Vibra Screw Bin Activator was installed on the storage bin to ensure successful operation of the new system and to eliminate bridging and packing. The bin activator is a vibrated bin bottom, replacing the converging bottom of a static bin, therby removing the compacting area. The bin activator is flexibly attached by rubber fitted forged steel hangers and a bolted seal ring assembly to the enlarged opening formed by cutting off the bin bottom. Bin activator vibrations are isolated from the bin itself by the hangers. The ring assembly facilitates installation and eliminates field fitting and welding. An oil-lubricated and cooled Gyrator vibrates the bin activator and the material in the bin, while an intergral vibrated baffle relieves the headload and transfers the vibrations to material far up in the bin. The material in the activator is thrown horizontally toward the discharge outlet, producing a constant flow of material. (Orr-FIRL)
W76-01549

POLYELECTROLYTES FOR POTABLE WATER TREATMENT.
Water Services, Vol 79, p 147-148, April, 1955.

Descriptors: *Polyelectrolytes, *Potable water, *Water treatment, Coagulation, Sludge treatment, Turbidity, Specifications, Sludge, Water quality, Costs.
Identifiers: Monomer acrylamide.

Polyelectrolytes are being used as coagulant aids in treating water for a potable supply. Although polyelectrolytes have not completely replaced inorganic salts as primary coagulants, they have proven effective in removing color and turbidity from natural waters when up to 5 mg/liter of finely divided sodium montmorillonite clay was added to the water first. One of the advantages of using cationic polyelectrolytes as primary coagulants is a reduction in the amount of sludge produced. Another application of polyelectrolytes in the treatment of potable water is conditioning of sludge before dewatering. The addition of polyelectrolytes accelerates the thickening of sludge by sedimentation before final dewatering. Examples are given of the many uses of polyelectrolytes in potable water treatment. The use of polyelectrolytes instead of activated silica has resulted in lower treatment costs and better finished water quality. The toxic monomer acrylamide is used in the manufacture of some polyelectrolytes. These polyelectrolytes must meet the following specifications established by the U.S. Food and Drug Administration, the U.K. Department of

the Environment, and similar agencies in other countries: no batch may contain more than 0.05 percent monomer acrylamide; the amount used must average no more than 0.5 mg/liter and never exceed 1.0 mg/liter; and, an upper limit for the content of monomer acrylamide must be stated by the supplier for every batch. (Dean-FIRL)
W76-01551

ACTIVATED CARBON FIGHTS BAD TASTE,
C. A. Black, and D. J. Sulick.
Water and Wastes Engineering, Vol 12, No 9, p 70, 72, 74, September, 1975. 3 fig, 2 tab.

Descriptors: *Water treatment, *Activated carbon, *Taste, *Odor, Potable water, Water quality, Filtration, Suspended solids, Organic compounds.
Identifiers: Filtrasorb 200 granular activated carbon.

Granular activated carbon filters have eiliminated taste and odor problems in the potable water supply of Granite City, Illinois. Filtrasorb 200 granular carbon was added to replace the sand in the city's eight filters. The filters were water soaked for one hour and then slowly backwashed to remove carbon fines. After the fines were removed, the backwash rates were increased to 10.5 gpm/sq ft, producing a 40% bed expansion at a minimum water temperature of 35C. The conversion of the sand filters to carbon filters was finished early in February 1971. Daily threshold tests have shown that the activated carbon filters consistently produce an effluent with a threshold odor value of less than one, irrespective of fluctuations in the quality of the raw water supply. Routine analytical tests to determine the exhaustion rate of the carbon show that about one-half of the adsorption capacity of the carbon has been used. Chlorinated hydrocarbons, phenols, pesticides, insedticides, and aromatic compounds are adsorbed by the carbon filters. The filters have also increased the removal of suspended solids while maintaining the filter head loss to a minimum. The lower backwash rate used with the carbon filters as compared to the rate necessary with the sand filters has resulted in a savings of backwash water. (Orr-FIRL)
W76-01553

EXPANDING A 1927 WATER PLANT FOR THE 1970'S,
H. F. Seidel, and J. L. Cleasby.
Public Works, Vol 106, No. 8, p 54-57, August, 1975. 4 fig.

Descriptors: *Water treatment, Hardness(Water), Filtration, Treatment facilities, Construction, Iowa.
Identifiers: Ames(Iowa), Lime-soda ash softening.

The development of the present Ames, Iowa, water treatment plant is discussed. In 1932, construction began on a new softening plant, to replace the small system that had evolved up to that time. A leading expert on softening was consulted and a plant with a two stage softening process, using lime and soda ash in one stage, and recombining sludge as a seeder for the second stage was constructed. In the 1950's, single stage treatment was experimented with to increase hydraulic capacity. In 1962, this single stage plan was implemented. The latest changes were made in 1971. Over the years a highly flexible, responsive modern treatment plant has been developed, with a minimum of gadgetry and automatic controls and thus a minimum of control and equipment maintenance. (Pinto-FIRL)
W76-01558

WHAT'S NEW IN WATER TREATMENT.
V. Fairweather.
Civil Engineering--ASCE, Vol 45, No 9, p 69-72, September, 1975. 2 fig, 2 tab.

Descriptors: *Water treatment, *Potable water, *Legislation, *Chlorine, Ozone, Activated carbon, Polymers, Coagulation, Filtration, Costs, Public health, Turbidity, Water quality standards.
Identifiers: Carbon Chloroform Extract, Safe Drinking Water Act, Carcinogens.

Various assessments of existing standards for potable water were reviewed, partially due to the discovery of potential carcinogens in the New Orleans, Louisiana, water. The largest controversy was on the use of chlorine both at the waste water treatment plant and at the water treatment facility, which may combine with trace organics to form the potential cancer-causing compounds. The two alternatives appeared to be the removal of all possible organics or the elimination of chlorine treatment. Removal of organics by ozone or by activated carbon treatment have been considered. Two proposed standards under discussion were the stringent turbidity standard (1.0 TU) and the Carbon Chloroform Extract (CCE) standard (0.7 mg/liter). The CCE test, which reveals the presence of organic compounds absorbed by carbon, has been criticized as being too broad to be meaningful. It is possible for a water supply to have a high CCE and not contain any carcinogens; it also feared that a water supply with low CCE may contain carcinogenic matter. Other issues under discussion included the advantages of polymer use over alum as a coagulant; the advantages and disadvantages of direct filtration; and the recovery and reuse of alum in sludge disposal. With the implementation of the Safe Drinking Water Act last year, costs of public health will be more carefully considered in the meeting of final standards. (Kramer-FIRL)
W76-01561

THE PREPARATION AND OXIDATIVE PROPERTIES OF FERRATE ION (FEO42-) STUDIES DIRECTED TOWARD ITS USE AS A WATER PURFYING AGENT, PHASE II,
Missouri Univ., Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W76-01687

WATER PURIFICATION DEVICE,
Gartner Research and Development Co., Bartlett, Ill. (assignee)
W. J. Gartner.
U.S. Patent No 3,909,402, 4 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2394, September 30, 1975.

Descriptors: *Water treatment, *Patents, *Water purification, *Filtration, *Adsorption, Water pressure, Activated carbon, Ion exchange, Resins, Equipment.

A system is provided in which the water to be purified flows through a vertical, elongated adsorbent-containing cartridge in an upward direction and is forced through the cartridge against the back pressure of a fine filter downstream of the adsorbent to provide a pressure within the adsorbent chamber between about 5 and 20 psig. The granular adsorbent comprises activated carbon for the purification of waters containing gases, or materials causing odors or colors. The granular material is an ion exchange resin, or a mixture of cationic and anionic exchange resins for the demineralization of water. In use, the purification device is placed in upright position near a source of tap water which is controllable with respect to pressure and rate of flow. The tap water source is connected to the inlet by a connection capable of withstanding moderate pressures; and the outlet of the device is arranged to lead to a receptacle for the purified water. (Sinha-OEIS)
W76-01725

CLARIFYING AGENTS FOR WATER,
For primary bibliographic entry see Field 5D.
W76-01727

ALUMINUM AND WATER TREATMENT. THE 'GULDAGER' ELECTROLYTIC PROCESS (L'ALUMINUM ET LE TRAITMENT DES EAUX. LE PROCEDE ELECTROLYTIQUE 'GULDAGER'),
H. Schaefli, and R. Grossenbacher.
Revue Suisse de l'Aluminium, No 5, p 128-129, May, 1975. 7 fig.

Descriptors: *Corrosion control, *Water treatment, Equipment, *Aluminum, Tanks, Electrolytes, Cathodic protection.
Identifiers: *Guldager process.

The 'Guldager' electrolytic system developed for corrosion and scaling prevention is described. The tank on the installation to be protected is provided with a pure aluminum plate serving as an anode connected to a d.c. source, while the tank proper serves as a cathode connected with the negative pole of the d.c. source. The rectifier voltage applied is between 10 and 25 Volts, and the current density varies from 100 to 400 mA/sq cm as a function of the water composition. The d.c. current flowing through the water counteracts the corrosion current; therefore, the tanks and heating surfaces are cathodically protected. The pipelines are protected against corrosion due to the aluminum anodes emitting colloidal aluminum hydroxide which forms protective layers in thicknesses up to 1-2 mm. Calcium carbonate scaling is prevented by the aluminum hydroxide particles encapsulating the carbonate particles. The carbonate coated with aluminum hydroxide settles on the tank bottom for easy removal. (Takacs-FIRL)
W76-01736

OZONE DEGRADATION IN PACKED COLUMNS,
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5D.
W76-01743

DEVELOPMENTS IN BACKWASHING OF GRANULAR FILTERS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 5D.
W76-01745

ASBESTOS AND CHLORINATED ORGANICS TOP AWWA DISCUSSIONS,
W. J. Storck.
Water and Wastes Engineering, Vol 12, No 8, p 26-28, August, 1975.

Descriptors: *Asbestos, Potable water, *Waste water treatment, *Water treatment, Water supply, Water reuse, Public health, Chlorination, Organic wastes, Colorado.
Identifiers: *Chlorinated organics, Denver(Colo).

Discussion of contaminants in waste water and drinking water was presented at the annual conference of the American Water Works Association. The focus was asbestos in potable water supplies and chlorinated organics in discharged effluents. A water treatment plant has been designed to remove asbestos fibers and lower turbidity in Duluth, Minnesota. The 30 mgd system consists of coagulation, flocculation, gravity filtration, wash water recovery, and sludge storage. The question of chlorinated organics as carcinogenic agents was debated, and the need for laboratory research (animal experiments) on the effects of both asbestos and chlorine was stressed. Other conference papers focused on reuse of waste water. The primary example was the Denver, Colorado, program. The proposed treatment method for Denver's 1.0 mgd demonstration plant consists of lime and other chemical coagulants, recarbonation, filtration, nitrogen removal by the clino system and then regeneration using the ARRP

stripping process, two stage carbon treatment with chlorine between the stages, a demineralization process, ozonization, and residual disinfection with chlorine. The importance of the public opinion for this and other proposed projects was discussed, and it was felt that the public is not generally opposed to reuse. (Kramer-FIRL)
W76-01786

SELECTION OF ECONOMICAL PIPE SIZES FOR WATER DISTRIBUTION NETWORKS,
Applied Cybernetics, Merritt Island, Fla.
D. G. Simmons.
Public Works, Vol 106, No 9, p 84-85, September, 1975. 1 fig, 1 tab, 4 ref.

Descriptors: *Water distribution(Applied), *Pipes, *Distribution systems, Piping systems(Mechanical), Costs, Economics, Evaluation, Computer programs, Analytical techniques.
Identifiers: Pipe size selection, 'Econ 2'.

A thorough analysis of hydraulic data for a water distribution system does not ensure that the most economical pipe size will be chosen. Pipe size selection is more dependent on economic factors than it is on hydrodynamic considerations. The most economical pipe sizes are determined by pipe diameter, pipe cost, and pumping cost. For any given pipe cost schedule, interest rate, flow rate and amortization rate, there is a most economical pipe size. Determination of the optimum set of economical pipe sizes for a distribution network is an iterative process involving the combination of the economical diameter calculation with the flow distribution analysis. Manual application of this analysical procedure is very time-consuming, however, the use of large high-speed time sharing facilitates the analysis. The 'Econ 2' program has been designed to add economical pipe size calculations to an existing software program for the analysis of flow and pressure distribution, 'Water X'. The application of 'Econ 2' to a small distribution system is illustrated by tables showing the system costs based upon the originally estimated pipe sizes and the cost analysis after calculation of the economical pipe sizes using 'Econ 2'. Selection of economical pipe sizes can represent a substantial cost difference. This procedure should be employed when constructing a new water distribution system or expanding an existing system. (Orr-FIRL)
W76-01787

IMPROVEMENT OF THE QUALITY OF WATER SUPPLY SOURCES (POLICY STATEMENT OF AMERICAN WATER WORKS ASSOCIATION).
For primary bibliographic entry see Field 6E.
W76-01962

THE SAFE DRINKING WATER ACT AND EPA'S ROLE IN TRAINING,
Environmental Protection Agency, Washington, D.C., Division of Water Supply.
For primary bibliographic entry see Field 5G.
W76-01963

5G. Water Quality Control

IMPLEMENTATION OF A N. P. D. E. S. DATA MANAGEMENT SYSTEM,
Krannert School of Industrial Management. Lafayette, Ind.
A. B. Whinston.
Available from the National Technical Information Information Service, Springfield, Va 22161 as PB247-112. $4.00 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 69, September 1975, 22 p, 4 fig, 17 ref. OWRT A-040-IND(1).

Descriptors: *Data processing, *Data storage and retrieval, *Monitoring, Computer models, Water quality standards, Indiana, Pollutant identification, Water pollution control, Information exchange, Information retrieval.
Identifiers: *National pollutant discharge elimination system, Generalized Planning system.

This is a case study of the National Pollutant Discharge Elimination System (N. P. D. E. S.) permit monitoring system specifically with the Indiana Stream Pollution Control Board. This system is concerned with the issuance of permits for polluting the state's waterways, as well as monitoring adherence to these permits. Such efforts necessarily (1) involve the collection, storage, and accession to large volumes of data, (2) and the utilization of models and algorithms that provide the needed analyses of the data. The computer-based data management and retrieval system presented releases the user from the tedious task of data management. The information system provides: (1) an organized structure for data storage; (2) report generation capabilities, and (3) simplified methods for selective information retrieval. The system was designed within the framework of the Generalized Planning System (GPLAN) developed at Purdue University. (Wiersma-Purdue)
W76-01502

WATER QUALITY CONTROL AND BUSINESS BEHAVIOR, WISCONSIN UNIV., MADISON. GRADUATE SCHOOL OF BUSINESS ADMINISTRATIONS,
Wisconsin Univ., Madison. Graduate School of Business Administration.
J. Bilkey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-113. $3.50 in paper copy, $2.25 in microfiche. University of Wisconsin Water Resources Center Technical Report WIS WRC 75-08, 1975. 19 p, 4 tab, 3 ref. OWRT A-052-WIS(1) 14-31-000-5050.

Descriptors: *Water pollution, Costs, Economics, *Decision making, *Feasibility, *Cost comparisons, *Water quality control, *Behavior, Attitudes, *Wisconsin, *Economic impact, Optimization, Surveys, Pollution abatement.

An important problem is how to achieve water quality control with minimal adverse economic impacts. This would seem to be an economic optimality problem involving two issues: ascertaining the optimum point between water quality and economic output, and devising a strategy for working toward that point. The following analysis focuses on the latter issue. It conceives of the adoption of water pollution abatement measures as an entrepreneurial type of problem in which each firm must ascertain how to adopt such measures into their operations and remain viable. Logically, then, anything which facilitates this entrepreneurial type of activity will hasten water pollution abatement. Alternatively, if this entrepreneurial type of activity fails to take place, attempts to force water pollution controls will merely drive firms out of business, with consequent unemployment and real income loss. Preparatory to designing research projects for ascertaining how to facilitate undertaking water quality controls, it seems desirable to examine the process by which firms undertake activities about which a considerable amount of information already exists. Exporting is useful for this purpose. This preparatory analysis involved in-depth interviews with the managers of ten Wisconsin firms regarding water quality control and their operations. For analogical insights a mailed questionnaire survey regarding export behavior was made of 423 small-sized Wisconsin manufacturing firms. Inferences were drawn for the adoption of water quality control measures, and a basis laid for a definitive study of the subject.
W76-01505

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert School of Industrial Administration. Lafayette, Ind.
A. B. Whinston.
Available from the National Technical Information Service Springfield, Va 22161 as PB247-142, $4.50 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center Technical Report No 68, September 1975, 63 p, 17 fig, 12 ref. OWRTA-031-IND(1).

Descriptors: *Data processing, *Decision making, *Planning, *Water quality standards, Basic data collections, Data storage and retrieval, Management, Indiana, Water quality control, Information exchange.
Identifiers: Generalized planning system.

A data management system is presented that will aid planners in the implementation of a decision support system which addresses the technical aspects of areawide water quality planning. The basis is the systematic study of the information flows and their relationships to the goals of the water planning group. The study involved a data processing program for the Technical Information Section of the Indiana Stream Control Board. The data required for the system includes (1) an area description, (2) quality goals, (3) point source data, (4) non-point source data, (5) cost information for the various types of treatments, (6) data on land use plans, populations and employment, and (7) design flow of municipal facilities. The study was an application of the GPLAN (Generalized Planning System) developed at Purdue University. The system is capable of supporting data bases and models for a wide variety of planning problems in addition to water quality management. The GPLAN is a valuable planning tool in that it automates the interfacing between data and models, and it offers a non-procedural, English-like interface between the planner and his computerized resources. (Wiersma-Purdue)
W76-01508

A REVIEW OF STATISTICAL PROCEDURES USED FOR EXAMINATION OF WATER DATA,
Massachusetts Univ., Amherst. School of Health Sciences.
For primary bibliographic entry see Field 7A.
W76-01509

PUBLIC PRIORITIES FOR GREAT LAKES RESEARCH,
Great Lakes Basin Commission, Ann Arbor, Mich.
W. C. Sonzogni, R. W. Reed, and L. T. Crook.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-088, $4.50 in paper copy, $2.25 in microfiche. Completion Report, 1975, 64 p, 1 fig, 30 tab, 9 ref, 5 append. OWRTX-148(NO 4250) (1).

Descriptors: Surveys, Data collections, Planning, Water resources, Planning, Short term planning, Water pollution control, Water quality, Management, Institutions, *Great Lakes, *Research priorities, Social participation, Attitudes.
Identifiers: *Research needs, Public interest groups, Non-point nutrient sources, Public participation, Public opinion.

A questionnaire was developed in order to survey public interest organizations as to the priority they place on Great Lakes research needs as well as to promote public awareness of research needs. The questionnaire consisted of 14 carefully selected research needs which could be rated according to high, medium, or low priority. Space was left on the questionnaire to add to the printed list any additional research needs that were felt to be important. The questionnaire also asked the respondents to rank their top five research needs for the Great Lakes in the order of their individual priority. Seventy percent of the 149 potential respondents

completed and returned the questionnaire, indicating a relatively high degree of success in involving Great Lakes public interest groups in research issues. The respondents included environmental and civic organizations, local planning organizations, and business, agricultural, and professional organizations. The results of this survey tend to indicate that public interest organizations have a strong interest in several research areas, such as pollution from nonpoint sources and methods of public participation in water resources issues.
W76-01515

AMES RESERVOIR ENVIRONMENTAL STUDY, SUMMARY REPORT.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 4A.
W76-01522

READING USAC PROJECT: SEWER AND WATER ACCOUNTS PROCESSING COMPUTER PROGRAM, RELEASE NUMBER ONE, SOFTWARE,
Reading, Pa. USAC Project.
H. George.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 407/5GA, $150.00 in paper copy, $2.25 in microfiche. May 75, 1 reel mag tape USAC-IMIS-RDG-002 HUD/DF-75/001 - Tape recording mode: 9 track, 800 or 1600 bpi; odd parity, EBCDIC; or 7 track, 556 or 800 bpi, odd or even parity, BCD. Documentation available. HUD-H-1212.

Descriptors: *Local governments, *Water supply, *Computer programs, *Pennsylvania, Management, *Sewerage, *Data processing.
Identifiers: *Reading(Penn), USAC project, Integrated municipal information systems, Software, *Urban Information Systems.

This tape contains the USAC Municipal Sewer and Water Accounts Processing (SWAP) Module for the Reading, Pennsylvania, Integrated Municipal Information System (IMIS). This Module maintains records for 29,000 water and sewer customers, post meter readings and calculate periodic consumption, produce water and sewer bills, post bill payments, and provide reports to the users of the system. There are 11 programs recorded on the tape. 32K bytes of core storage and 32M bytes of disk storage are needed to operate this module on a UNIVAC Model 9300 II computer. . .Technical documentation describing this Module includes: USAC-RPA2-3241, Design Specifications for the Sewer and Water accounts processing Module; USAC-RPA2-4041, Program Specification for the Sewer and Water Accounts processing Module User's Manual. . .Software Description: These programs are written in COBOL for implementation on a UNIVAC Model 9300 II computer using the UNIVAC 0S500 NCOS Rev. 4 operating system. The Data Base Management System is the Reading DMT Version 1, Release 1, Level 1.
W76-01527

INDUSTRIAL POLLUTION OF THE LOWER MISSISSIPPI RIVER IN LOUISIANA.
Environmental Protection Agency, Dallas, Tex. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-01532

HIGH-PRESSURE WATER JET CLEANING OF SUBSURFACE DRAINS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 8C.
W76-01564

LOW PRESSURE JET CLEANING OF PLASTIC DRAINS IN SANDY SOIL,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 8B.
W76-01569

A WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY BASIN, PART 1.
Public Works, Vol. 105, No 5, P. 80-86, May, 1975, 4 fig, 1 tab.

Descriptors: *Water quality control, *Planning, *Water resources planning, *Water quality standards, *Projections, Watersheds(Basins), River basins, Land use, Management, *California, Bays.
Identifiers: *San Francisco Bay(Calif), Porter-Cologne Act(Calif), Effluent limits.

This is an example of basin-wide management demanded by state and federal funding. Plans had to meet Environmental Protection Agency and California's Porter-Cologne Act requirements and had to delineate water quality objectives to establish waste discharge requirements regionally. This basin system includes 80 separate drainage basins occupying 3465 square miles, the largest seven basins accounting for 58% of the area. Studies included population projections, land use potential, economic development, and water use development. Water demand is anticipated to be 1.5 million acre feet per year by the year 2000 whereas projected resources are 1.75 million acre feet per year by 1984. Quality of water could vary depending on sources of supply and consumption patterns. Water quality objectives, including 20 categories of use, were identified after desirable uses of water were established. 'Objectives' is used here to indicate a formal standard toward which control efforts are directed and include thermal provisions, pH, dissolved oxygen, turbidity, sulfide, coliform organism concentrations, ammonia, chloride, and total dissolved oxygen. Other considerations were levels of biotic growth, detrimental deposits, floatables, color, odor, taste, fish flesh tainting, radioactivity, toxicity, pesticide contributions, livestock watering, and domestic uses. Waste load projections to the year 2000 were generated for point and other sources. In addition EPA requirements were complied with by classifying and ranking basin waters according to severity of pollution so that more adverse conditions could receive priority funding. (See also W76-01594) (Smith-North Carolina)
W76-01593

A WATER QUALITY CONTROL PLAN FOR SAN FRANCISCO BAY BASIN, PART 2.
Public Works, Vol 105, No 6, p 75-80, June, 1975. 2 fig, 1 tab.

Descriptors: *Water quality control, *Planning, *Water resources planning, *Alternative planning, *Water reuse, *Environmental effects, *Wastewater treatment, River basins, Watershed management, Evaluation, *California, Treatment facilities, Bays.
Identifiers: *San Francisco Bay(Calif), Facilities requirements, Effluent limits.

To arrive at a plan for this basin, consideration of a number of planning concepts and basin-wide environmental issues was necessary as well as the development of several planning strategies. Key issues were: (1) the use of advanced treatment versus the use of superior dilution-assimilation to low risk zones; (2) regional vs. local treatment facilities; (3) reuse of wastewaters for agricultural and industrial uses, groundwater recharge and streamflow augmentation; and (4) flexibility in timing and placement of facilities to be determined by population growth. Five planning strategies were selected for analysis as follows: (1) the existing plan, a subregional composite; (2) limited consolidation of existing facilities; (3) consolidation of facilities toward areas of potential wastewater reuse or land application with discharge of plan effluents to receiving waters in those areas; (4) regional consolidation of facilities with discharge away from sensitive areas; (5) regional consolidation with discharge to areas of greatest assimilative capacity. It was concluded that continued discharge into San Francisco Bay with upgrading of treatment was best. The degree of regionalization of the first strategy (the existing plan) was deemed best in terms of probable environmental enhancement and long-term reliability, though this might be more expensive than other alternatives. The Plan includes a description of necessary wastewater facilities, non-point control measures, and additional control actions necessary for implementation. The plan was thought to be superior because it intrudes less into environmentally sensitive areas than other alternatives though some adverse impacts are likely. (See also W76-01593) (Smith-North Carolina)
W76-01594

MANAGING THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-01597

ECONOMIC IMPACT OF RECENT ENVIRONMENTAL LEGISLATION,
Water and Wastewater Equipment Manufacturers Association, Chicago, Ill.
For primary bibliographic entry see Field 6C.
W76-01610

HENRY GEORGE, PROPERTY RIGHTS AND ENVIRONMENTAL QUALITY: CLASSICAL ANSWERS TO 'NEW' PROBLEMS,
Clemson Univ., S.C.
B. Yandle, and A. H. Barnett.
American Journal of Economics and Sociology, Vol 33, No 4, p 393-400, 1974. 27 ref.

Descriptors: *Water quality, *Water rights, *Resources allocation, *Welfare(Economics), Aesthetics, Pollution taxes(Charges), Market value, Ethics.
Identifiers: *Usufructure, *Property rights.

Henry George's theory of property rights is applied to environmental quality, and particularly to water quality and its allocation. In order to allocate a resource efficiently it is only necessary that certain characteristics of the resource be assigned to a system of property rights, specifically in this instance, the usufructure. Following this identification water quality can then be allocated as a basis for charges for use, both by consumers and polluters, as suggested and detailed by J. H. Dales. Essentially, the use of the natural resource could be distributed optimally among competing users and all monopoly rent held by existing appropriators of water quality would be extracted. The ethical implication that resources are a part of national wealth--that each member of society has some inherent claim to them, carries with it a special implication when allocative systems for distributing those resources are considered. If a group of environmental quality consumers were asked to submit their bids for marginal units of water quality and if they were told that each would pay for the quality obtained and be reimbursed for that on which they were outbid, the bids would tend to be honest and the resource would tend to be allocated efficiently. (Auen-Wisconsin)
W76-01614

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
D. E. Pingry, and A. B. Whinston.
Journal of the Environmental Division, Proceedings of American Society of Civil En-

gineers, Vol 100, No EE1, p 61-75, 1974. 7 tab, 8 ref.

Descriptors: *Water pollution control, *Model studies, *Multiple purpose, Planning, Decision making, Indiana, Dissolved oxygen, Thermal pollution, Algorithms, Resource allocation, Optimization, Linear programming.
Identifiers: West Fork White River(Ind).

A conceptual framework for applying optimization simulation techniques in water pollution management in a river basin is presented. The model is based on four different sets of dissolved oxygen quality goals and their annual costs for the West Fork River, Indiana, and an additional goal in reducing thermal effluents, both relatively independent in this river application, i.e., if the thermal pollution problem was rejected and the least cost solution of the BOD problem was determined, the structures built and the treatment levels determined would be the same costs as those in reducing thermal pollution. The goals were chosen to illustrate the possible economies which might be obtained by moderating quality goals downstream from a major pollution source and stiffening the quality goals upstream. The model provides information on externalities to be considered in this resource allocation as applicable to affected conflicting interests. The planning process would continue until an 'acceptable allocation' is reached. The speed of convergence to a solution would be dependent on the type of decision rule used. This approach indicates that the possibility exists for enormous quality gains at much lower cost than would be incurred under treatment at the source and imposition of uniform standards. (Auen-Wisconsin)
W76-01616

A RATIONALE FOR A CORPORATE AIR POLLUTION ABATEMENT POLICY,
California Univ., Riverside.
T. A. Ferrar.
American Journal of Economics and Sociology, Vol 33, No 3, p 233-236, 1974. 4 ref.

Descriptors: *Pollution abatement, *Air pollution, *Industries, *Social aspects, Return(Monetary), Economic justification, Labor supply.
Identifiers: Corporate support.

A rationale for corporate support of regional air pollution abatement is offered based on the basic profit incentive. It is propounded that air pollution control expenditures will accrue over future periods in a fashion difficult to quantify, but significant. The specific social policy of air pollution control is examined with the view of eoconomic justification through a simple theoretical construction manifesting an air-quality related labor market warping that imposes a real cost burden on the business sector. Because a business community does not function by labor quantity alone, but requires a technically specialized mix undesirable air quality would induce the more educated, specialized labor force to leave the area. Thus it would be the qualitative warping of the regional labor supply in response to air quality deterioration that would impose a real impact on the corporate return. (Auen-Wisconsin)
W76-01619

ENERGY--ENVIRONMENT.
Ballinger Publishing Co., Cambridge, Mass.
For primary bibliographic entry see Field 6B.
W76-01620

THE ECONOMICS OF THE WEST COAST OIL SPILL CLEAN-UP INDUSTRY,
Naval Postgraduate School, Monterey, Calif.
C. M. Stone.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A-003 860, $4.50 in paper copy, $2.25 in microfiche. MS thesis, December 1974. 78 p, 5 fig, 6 tab, 14 ref, 2 append.

Descriptors: *Oil spills, *Industries, *Water pollution control, Pacific Coast region, Pollution abatement, Return(Monetary), Financial feasibility, Risks, Fluctuations, Elasticity of demand.
Identifiers: *Oil spills clean-up industry, Seattle(Wash), Portland(Ore), San Francisco Bay(Calif), Los Angeles(Calif), Long Beach(Calif), San Diego(Calif).

The effects of the great fluctuations in demand for commerical firms in oil spill clean-up on the West Coast as related to their return on investment and profits; that industry's viability as affected by clean-up service provided by the private sector, the non-profit cooperative sector, and the government sector; and the overlap of the various sectors is discussed. The interaction of equipment and personnel of the complimentary sectors strengthen the need for each sector of the industry. Commerical firms have concentrated their clean-up capability towards minor spills due to the high cost of large-scale equipment required on moderate and major spills, but they contribute to large-scale clean-up incidents within limits of their capability. The impact of demand uncertainty for the commerical firms is mitigated by the extent of their dependence on clean-up activity as a source of revenue or whether the firm is oriented to other services. The study indicated a trend for increased dependence on other than clean-up activities (marine-industrial cleaning services, tug and barge service, and pollution prevention) by most of these firms. The nine firms investigated shared a 2.4 million dollar per year industry but the uncertain nature of clean-up prevents any prediction of potential growth. (Auen-Wisconsin)
W76-01624

STATE OF THE ART--ACID MINE DRAINAGE CONTROL,
Consolidated Coal Co., Library, Pa.
J. L. Lombardo.
Presented at the American Mining Congress Convention, September 9-12, 1973. Denver, Colo. 25 p, 7 fig, 6 tab.

Descriptors: *Acid mine water, *Mine drainage, *Treatment, *Control, Lime, Treatment facilities, West Virginia, Ohio, Pennsylvania, Sludge disposal, Costs, Gypsum, Fouling, *Reviews.
Identifiers: Consolidated Coal Co Library(Pa), Case studies.

Most active mine discharges are alkaline, containing little or no iron; some are alkaline or nearly alkaline and contain iron. True acid mine drainage has low pH and contains large amounts of iron and other metals. The last two types require treatment and lime is the method of choice. Three Consolidated Coal Company treatment plants are described. Water at the Mingo Plant is mildly acid, at the McMurray Plant it is less acid, has a higher iron level, and contains bicarbonates which could cause sludge settling problems; and at the Whetstone plant water quality is poor with large amounts of acidity, iron, aluminum, and sulfates. Total treatment costs vary from $150,000-200,000/year. Major cost items are lime ($12,000-64,000/year) and capital recovery ($22,000-29.000/year). Costs per 1000 gal are 30 cents at Mingo, 13 cents at McMurray, and 72 cents at Whetstone. The problem of poor settling after aeration was solved by eliminating aeration and making the pH higher to remove iron as ferrous hydroxide. Yearly cleaning of sludge settling zones is provided. Removal of sulfate as the precipitates of calcium sulfate or gypsum improves water quality but increases maintenance and equipment costs and reduces plant design options. (Buchanan-Davidson--Wisconsin)
W76-01625

INTERCEPTING TRENCH AT A LANDFILL RENDERS LEACHATE INTO DRINKABLE SOURCE OF WATER,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
J. R. Anderson, and J. N. Dornbush.
Solid Wastes Management/RRJ, Vol 15, No 1, p 60-62, 64, 66 and 68, 1975. 1 fig, 1 tab.

Descriptors: *Water pollution, *Quarries, *Landfills, *Groundwater, Garbage dumps, Public health, Trenches, Leachate, Potable water, South Dakota, Ponds, On-site tests, Interception, Water pollution control, Waste dilution, Alteration of flow, Burning.
Identifiers: *Brookings(SD).

Groundwater quality as affected by a refuse landfill in a gravel pit that penetrates a high water table was studied at Brookings, South Dakota. Groundwater showed an increase in dissolved minerals. An algae-laden pond downstream received groundwater from the fill area and helped reduce hardness and alkalinity during the summer. Degraded water was confined to a zone paralleling the direction of groundwater flow where specific conductance and total hardness were twice that of native water; sodium and chloride concentrations were increased 6- and 15-fold, respectively; only manganese was higher than the recommended limit for drinking water. Water quality improved downstream sufficiently for use as a domestic water supply or irrigation. A trench built downstream to the water table slope intercepted degraded water and treated it by dispersion, dilution, or algal photosynthesis, causing organic groundwater contaminants near the fill to decrease. Refuse should not be deposited in open ponds or places that will be immersed when the groundwater table rises. Burning should be avoided. Excellent drainage should prevent infiltration from reaching the refuse. Using tighter soils for the final earth layer and compaction would reduce leaching. (Buchanan-Davidson--Wisconsin)
W76-01627

CASE HISTORY ON ACID MINE DRAINAGE CONTROL,
Bethlehem Steel Corp., Pa.
F. M. Temmel.
Presented at the American Mining Congress Convention, September 9-12, 1973. 29 p, 10 fig, 1 tab.

Descriptors: *Acid mine water, Treatment, Technology, Acidic water, Lime, Neutralization, Underground waste disposal, Treatment facilities, Pennsylvania, Sludge disposal, Pilot plants, Costs.
Identifiers: Case studies, High-Density Sludge Process, Settled solids.

Methods for treating acidic waste waters from coal-mining operations and from steel plants were evaluated. Lime neutralization and assimilation in a coal-cleaning circuit was used to treat acid mine drainage from a high-volatile coal seam but not from a low-volatile coal seam. Dewatering of sludge is a critical limitation. A modified lime neutralization process produced high-density sludge. Depending on mine-water iron oxidation state, sludges contained 15-40% solids. Higher sludge concentrations make filtering or contrifugation possible. When the total iron ferrous content was above 70%, sludge density increased. With both ferrous and ferric wastewaters, the optimum range of the ratio of recirculated solids to solids precipitated from acid mine-water by neutralization was 25:1 to 30:1. Optimum pH was 7.2-7.7. A one minute detention time produced maximum density sludges; ten minutes ensured ferrous iron oxidation and precipitation at pHs above 7.2. Mine-water aeration before neutralization reduced lime demand. Underground sludge disposal induced further dewatering. The High-Density Sludge Process was effective for acid mine drainage treatment and was applied to mine-water discharges at the Bethlehem Mines Cambria Divi-

sion to treat 3 mgd acid rinsewaters from continuous stripndescaling lines. Plans are being made to treat 2 mgd acid wastewater from a wire-mill descaling operation by this method. (Buchanan-Davidson--Wisconsin)
W76-01650

SOME NEW APPROACHES TO SOLVING URGENT PROBLEMS IN THE THEORY AND PRACTICE OF HYGIENIC STANDARDS FOR INJURIOUS SUBSTANCES ,
M. A. Pinigin.
Available from the National Technical Information Service, Springfield, Va 22161 as PB220-229, $3.50 in paper copy, $2.25 in microfiche. National Institutes of Health Translation. NIH-73-235, May 1973. 6 fig, 29 ref, Translated from Vestnik Akademii Meditsinskikh Nauk SSSR, Vol 27, No 1, p 82-86, 1972.

Descriptors: *Air pollution effects, *Chemicals, *Epidemiology, Standards, Lethal limit, Absorption, Public health.
Identifiers: *Toxicology, USSR, Permissible uptake.

Laboratory tests were conducted on white rats to determine the toxicity of inhalation of chemical substances, dependent on dose-time, as a basis for developing standards of chemical emissions in the USSR as well as evaluation of intermittent effects of chemical pollutants in the environment, which fluctuate considerably over time. The determination of permissible concentrations were also based on biological modification of absorbed chemical pollutants. The experimental data showed that during uniterrupted inhalation the time of the onset of certain toxic effects in animals increases with reduction of the concentration of the substance. The concentration-time dependency curves have a characteristic form for each substance. Acute toxicity curves are shown for inhalation of benzine, benzene, styrene, and acrolein. Certain physiological and biochemical shifts have likewise been obtained showing characteristic curves of the concentration-time dependency. A graphic expression for the 'concentration-time' dependence would permit the development of a quick method for the average-day permissible amounts of atmospheric contaminants. Nomograms can be constructed to indicate physiological and biochemical shifts which may be significant in evaluating the intermittent effect as well as for developing standards for industrial and atmospheric pollutants. This research may also contribute to the theory of medical toxicology. (Auen-Wisconsin)
W76-01659

A CURRICULUM ACTIVATIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES, APPENDICES, VOLUME 2.
Environmental Protection Agency, Washington, D.C. Training Grants Branch.
For sale by the Superintendent of Documents, U.S. Government Printing Office. Washington, D.C. 20402 Price $2.25. 1972. 252 p, 9 fig, 15 tab, 15 plates, 33 ref.

Descriptors: *Education, Water, *Training, *Environment, *Water pollution, On-site investigations, On-site tests, Water sampling, Sampling, Analytical techniques, Water analysis, Analysis, Laboratory tests, Chemistry, Biology, Water chemistry, Aquatic life, Aquatic environment, Bacteria, Ecology.
Identifiers: Curriculum activities guide.

Intended as a reference aid for teachers using the Curriculum Activities Guide, the appendixes provided technical information on water sampling, aquatic life, and other field investigations appropriate for students in an environmental studies course. Chemistry, bacteriology, aquatic biology, and engineering and physics were the general area covered. Basic chemical parameters of water were discussed, and testing procedures were described. Instructions for doing bacterial counts were given. Drawings were provided in a key to types of plankton and other aquatic organisms. Field methods for taking biological samples and laboratory techniques for their analysis were described. A simple flow chart explained how to interpret biological data. Mapping, flow measurement, and computer use were described in relation to water surveys. A list of references sources useful to students through the 12th grade level was given, including books, movies, periodicals, and equipment. A glossary covered basic terms on water properties, water pollution, water resources and aquatic ecosystems. (Robinson-ISWS)
W76-01660

POTENTIOMETRIC TITRATION BEHAVIOR OF SODIUM SULFIDE, METHYL MERCAPTAN, DIMETHYL SULFIDE, DIMETHYL DISULFIDE AND POLYSULFIDES IN MIXED ALKALINE SOLUTIONS AND SULFATE PULPING BLACK LIQUORS,
Borden Chemical Co., New Westminster (British Columbia).
For primary bibliographic entry see Field 5A.
W76-01670

CLEANING COAL WITH COAL: COAL HUMIC ACIDS FOR REMOVAL OF ACID, IRON, HEAVY METALS, AND ORGANIC POLLUTANTS ASSOCIATED WITH USE OF COAL AS A FUEL,
Missouri Univ., Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W76-01688

GROUNDWATER MANAGEMENT AND SALINITY CONTROL: A CASE STUDY IN NORTHWEST MEXICO,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 4B.
W76-01695

RATES OF HERBICIDES IN IRRIGATED COTTON,
Agricultural Research Service, Phoenix, Ariz.
For primary bibliographic entry see Field 3F.
W76-01698

RECOVERY OF OIL AND OIL-SOLUBLE CONTAMINANTS FROM THE SURFACE OF WATER,
R. G. Hoegberg, and W. S. Tyler.
U.S. Patnet No. 3,905,902, 5 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1234, September 16, 1975.

Descriptors: *Patents, *Oil pollution, *Oil slicks, *Water pollution control, Water pollution treatment, *Water quality control, Skimming, Equipment, Electric fields, *Separation techniques.
Identifiers: Negative electrostatic charges, Discs.

A method of recovering oil or oil-soluble contaminants from the surface of water while minimizing the simultaneous pickup of water consists of partially immersing in the water a number of discs of hydrophobic dielectric polymer which are electrostatically isolated from grounded conductors in contact with the water. The discs are rotated so that the rim portion of the discs is moved through the water to pick up oil or oil-soluble contaminants floating on the water. The discs are frictionally wiped to remove all of the picked up material from the area of contact. The frictional wiping contact and the speed of rotation of the discs triboelectrically establishes and the electrostatic isolation maintains a negative electrostatic charge on each of the discs. (Sinha-OEIS)
W76-01714

BELT DEVICE FOR COLLECTING FLOATING MATTER FROM WATER SURFACE,
Bridgestone Tire Co. Ltd., Tokyo (Japan). (assignee)
K. Aramaki, H. Kawakami, and M. Suzuki.
U.S. Patent No 3,907,685, 5 p, 15 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 938, No 4, p 1839, September 23, 1975.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, *Oil pollution, Oil spills, Flotsam, Jetsam, Skimming, Equipment.
Identifiers: Endless belt.

The invention is a belt device for collecting floating matter from water surface comprising a pair of pulleys, one of which is arranged above the water surface and the other pulley arranged below the water surface, and an endless belt loosely engaged with the pulleys and having a lower loosening portion inclined from a relative direction of water flow by an acute angle. The circumferential length of the endless belt is so long that the belt loosely engages with the pair of pulleys. The circumferential speed of the pulley arranged above the water surface is made large as compared with that of the pulley arranged below the water surface. The lower loosening portion of the belt is subjected to buoyancy below the surface of the water and pushed by the water flow directed toward the belt so that the part of the belt positioned near the water surface becomes inclined from the water surface by a smaller angle. As a result, the lower loosening portion is liable to get intimate with the surface of the layer-like floating matter and smoothly pull the floating matter into the water without difficulty and further flexibly adapts to waves or strong water flow directed toward the belt, so that excessive collision and interference to the belt is not caused, and the floating matter can be accurately collected. (Sinha-OEIS)
W76-01722

DEVICE FOR DAMPING THE SURGE OF WATER WAVES PARTICULARLY FOR A FLOATING BODY DESIGNED TO CLEAN POLLUTED WATER,
J. Rafael.
U.S. Patent No 3,909,417, 3 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2399, September 30, 1975.

Descriptors: *Patents, *Water pollution control, *Pollution abatement, *Oil pollution, *Oil spills, *Waves(Water), *Surges, Retardance, Boats, Ships, Equipment.
Identifiers: Dampening.

In order to efficiently remove the oil floating on a water surface, it is necessary to peel off only a certain thickness of the polluted water surface and to guide it into the cleaning ship. In this invention a device is described in which oil-polluted water can be cleaned even when the sea is aroused and the surge is relatively strong. A device for damping the surge of water waves is designed for use on a cleaning ship or other floating body and is a pivotable body furnished with a fin which can be immersed either partly or fully in the water and whose oscillating motions caused by the water waves are damped. The damping action can be increased when the longitudinal section of the fin has the shape of a damped sinusoidal wave. This is achieved in that the fin damps the oncoming wave with as little shock as possible. The damping body may be attached to the front of a cleaning ship and can be folded back in the deck. The oncoming waves are damped and the oil-covered surface layer is guided into the inlet opening of the cleaning ship. The device may be made of metal, plastics or inflatable rubber fabric. (Sinha-OEIS)
W76-01731

STAGE 1 DEVELOPMENT OF THE SHOALHAVEN SCHEME-I.
Snowy Mountains Engineering Corp., Cooma (Australia).

For primary bibliographic entry see Field 6B.
W76-01732

R AND D PRIORITIES ON THE NATIONAL AGENDA FOR WATER POLLUTION CONTROL,
Water Pollution Control Federation, Washington, D.C. Research Committee.
R. S. Engelbrecht.
Professional Engineer, Vol 45, No 10, p 21-23, October, 1975. 2 fig, 3 tab.

Descriptors: *Water pollution control, *Legislation, *Financing, *Research and development, Analytical techniques, Waste water treatment, Environmental effects, Personnel.
Identifiers: Federal Water Pollution Control Act Amendments of 1972.

The 1985 goals of the Federal Water Pollution Control Act Amendments of 1972 will not be met if the provision of funds for research and qualified research personnel is maintained at its present level. EPA financing of municipal technology R and D has been greatly reduced since 1967. No adjustments have been made for inflation. The number of students enrolled in water pollution control academic programs has also decreased. This is partially due to the reduction of EPA funding for graduate or professional training grants. The present training grant program will end in July 1976. Even though present knowledge and technology have been of undeniable use, additional knowledge and technology are needed if the desire for further growth and development and the necessary improvement of water resources are to be conciliated. Four major aspects of research are briefly reviewed: analytical techniques; waste water treatment; residue management; and environmental effects. (Waltner-FIRL)
W76-01733

ENVIRONMENTAL CHEMISTRY IN THE NETHERLANDS,
Waterloo Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-01734

MAINTENANCE OF WATER QUALITY,
J. Pullin.
Surveyor, Vol 146, No 4344, p 7-8, September, 1975.

Descriptors: *Water quality control, Standards, *Water pollution control, Reservoirs, Water supply, Monitoring, Waste water treatment, Legislation, Chemical wastes, *Water quality standards.

The main topics of a symposium held by the Institution of Water Engineers and Scientists are reviewed. Protective measures for three water sources were first considered. Reservoirs are now more accessible to the public, and new means of protecting them must be found to avoid a higher risk of pollution. The bulk of pollutants must be expelled from river sources, and the remaining portion treated. The establishment of the river intake, monitoring, and storing, as well as an efficient liaison system are essential for maximum protection. Groundwater sources should be protected to avoid potential areas of pollution, and buildings, agriculture and industry should also be carefully planned. Discussion of the control of effluents dealt with the legislative aspects of pollution control and with the problems involved in presenting water standards. The need was expressed to reevaluate the bases for the application of effluent standards and to produce more effective screening of new chemicals involved in industrial processes. Also discussed were the criteria defining raw water and the means of monitoring it. Three types of emergencies were listed and emergency handling procedures based on a coordinated management structure with efficient communications were proposed. (Waltner-FIRL)
W76-01735

FACILITIES PLANS: CLEARING UP THE CONFUSION,
K. Kirk.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2015-2018, August, 1975.

Descriptors: *Legislation, *Federal jurisdiction, *State jurisdiction, *Planning, Federal Water Pollution Control Act, Water pollution sources, Water pollution control, Water quality control, Administration, Regulation, Municipal water, Storm water, Water resources development.
Identifiers: Nonpoint pollution sources.

Section 208 of the Federal Water Pollution Control Act, which relates to planning activity at the state level, is discussed. In particular, Section 208(a)(6) states, 'The state shall act as the planning agency for all portions of such state which are not designated'. While it has been argued that existing basin planning is not adequate to accomplish control of nonpoint source pollution, it was also stressed that no water quality planning should be carried out for area in which problems do not exist or will not develop the 20-year planning period. Revised regulations published on July 16, 1975, are more specific as to the scope of state planning in nondesignated areas and define the state water quality management plan as a 'management document'. Initial plans must be completed and submitted to the EPA regional administrator by July 1, 1978, and adopted by July 1, 1979. Plans must assess nonpoint source problems and needs; contain a statewide antidegradation policy and methodology for its implementation; forecast both municipal and industrial facilities needs for a 20-year period; define urban and industrial storm water system needs; provide operating and implementing agencies; and analyze the various impacts of the plan. No decision has yet been made as to whether to use Section 208 funds or some other source for the state planning programs, and while regulations specify July 1979 as a plan adoption deadline, NRDC is urging November 1977 as the key date. (Kramer-FIRL)
W76-01782

EPA MONEY PROPOSALS CAUSE CONCERN,
Passiac Valley Sewerage Commission, Newark, N.J.
S. A. Lubetkin.
Water and Wastes Engineering, Vol 12, No 8, p 43-44, August, 1975.

Descriptors: *Legislation, *Federal Water Pollution Control Act, Costs, Federal jurisdiction, State jurisdiction, Construction costs, Water quality standards, Treatment facilities, Waste water treatment.
Identifiers: Federal funding, Construction grants.

Five administration proposals to amend the Federal Water Pollution Control Act Amendments of 1972, which were suggested in May 1975, are evaluated. Topics were: reduction of the federal share of project costs; limitations of federal funding of reserve capacity to service projected growth; restriction of the types of projects eligible for grant assistance; extension of the 1977 date for publically owned treatment works to meet water quality standards; and delegation of a greater portion of the management construction grants program to the states. It was argued that even if the federal share of project costs is lowered from 75% to 55%, these figures are for construction costs only, and the operation and maintenance costs will continue to be paid by the municipalities. Secondly, some flexibility must be maintained if funding of prospective growth is limited. If the types of projects eligible for grant assistance are restructed, it is suspected that this will not encourage state or local self-sufficiency. However, high priority items on both the federal and local levels should be financed first. It was strongly suggested that construction grant management programs should be delegated to a state if and only if the state has demonstrated its ability to handle it. It was also recommended that, in terms of the 1977 deadline for water quality standards, the Administrator must grand compliance schedule extensions on an ad hoc basis, upon the availability of Federal funds and upon time required to build the necessary facilities. In summary, treatment and disposal facilities should be reviewed on an individual basis, allowing cost-benefit analyses, and the municipalities should decide what is equitable. (Kramer-FIRL)
W76-01783

CLEAN WATER WILL COST $159 BILLION.
Engineering News Record, Vol 195, No 12, p 40, September 18, 1975.

Descriptors: *Waste water treatment, *Capital costs, *Operating costs, *Sewers, *Sewage treatment, *Overflow, Infiltration, Construction materials, Sludge, Biochemical oxygen demand, Water pollution control, Analytical techniques.

Results of a study by the National Commission on Water Quality on the costs of providing municipal sewage treatment at the government's standards for 1983 'best available technology' are reported. The total spending necessary is about 159 billion dollars. Of this, $79.6 billion will be used for correction of combined sewer overflows, 80% of that for construction of new storage facilities. Secondary treatment to meet the 1977 'best practicable technology' standards will cost $10.8 billion; advanced waste water treatment, $24.8 billion; rehabilitation of existing sewer systems, $9.5 billion; infiltration control, $6.9 billion; new collectors, $13 billion; and new interceptors, $13.5 billion. Expenditures are also detailed for publically owned treatment works for construction materials and collection systems. The construction time is estimated, and the majority of this will be used for improving the combined sewer overflows. With the new investment, a 60% decline in BOD and suspended solids removal is projected, as well as an increase in sludge production to a level of 14.4 million tons of sludge on a dry solids basis, because the volume of waste water will grow considerably. The decision to meet the 1977 and 1983 goals is dependent upon the condition of municipal finances and actions. (Kramer-FIRL)
W76-01784

EPA COMPLETES NEW PLANT AND SEWER INDEX DATA SERIES.
Engineering News Record, Vol 195, No 12, p 114, September 18, 1975. 3 tab.

Descriptors: Analytical techniques, *Sewers, *Costs, *Construction, Labor, Data collections, Water pollution control, Concrete, Municipal wastes, *Treatment facilities, Waste water treatment.
Identifiers: Sewer indexes, Cost indexes.

The latest Environmental Protection Agency's urban sewer system cost indexes were published and complete the set of cost data for water pollution control construction. Data are presented for 25 cities in each of three categories: 5 mgd municipal waste water treatment facilities; 50 mgd municipal waste water treatment facilities; and complete urban sewer systems. All three indexes' United States averages rose slightly in the third quarter of 1975. The new complete urban sewer system indexes were based on factors including: under labor, common labor, cement finisher, carpenter, and medium equipment operator. Labor rates included fringe benefits. Materials were concrete of the 300 psi ready-mix type, pipe of reinforced concrete, 24 inches, paving asphalt in tank cars, and lowest grade lumber (2 x 10 S4S). Needs for both old and new indexes were measured by the EPA from the results of a questionnaire given to over 100 public and private

recipients of index data. Of 98 responses, 42 expressed a need for the continuation of the old indexes. The latest United States averages for the old indexes, corrected back to June, 1974, are also presented. (Kramer-FIRL)
W76-01785

SAFE DRINKING WATER ACT, ACT I SCENE I OF HERE WE GO AGAIN,
C. W. Heckroth.
Water and Wastes Engineering, Vol 12, No 8, p 14-18, 20, 22, 24, August, 1975.

Descriptors: *Legislation, Effluents, Water treatment, Waste water treatment, Regulation, *Federal jurisdiction, State jurisdiction, *Water quality control, Public health.
Identifiers: *Safe Drinking Water Act, Cost-effectiveness.

A critical review of the new safe drinking water legislation, PL 93-523, is presented. Four areas of controversy at the American Water Works Association annual conference were the chlorine/carcinogen controversy, effluent guidelines for water treatment plant waste disposal, waste water reuse for potable water and the impact of this Act. Speaking for the EPA, John Quarles argued that the methods of achieving goals for better water quality would be more flexible and realistic than those of PL92-500. Negative reactions to the Act were expressed by some state representatives, who felt that the Federal Government will have too rigid control over areas that have been under state jurisdiction. Specific criticisms of the Safe Drinking Water Act included: the chlorine residuals portion of the Act should be amended to allow for a level of 1.0 mg/liter in the distribution system; more emphasis should be placed on corrective action, rather than reporting violations and taking samples; turbidity should not be a primary standard because that action disregards regional differences; not enough stress has been placed on inspection of systems and correction of marginal conditions; and various funding aspects are poor and the individual customers are expected to pay for increased services 'whether or not they want these services.' Overall, there is a basic difference in philosophy between the EPA and the states as to whether a water quality control program should be directed towards protection of health or towards being cost-effective. (Kramer-FIRL)
W76-01788

LOCAL LAND USE CONTROL OVER CRITICAL AREAS,
American Society of Planning Officials, Chicago, Ill.
For primary bibliographic entry see Field 6E.
W76-01790

SOME ENVIRONMENTAL PROBLEMS AND THEIR SATELLITE MONITORING,
Tel Aviv Univ., (Israel). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W76-01791

GOVERNMENT DOLLARS TO FUEL 18% GROWTH IN 1976 SEWERAGE MARKET.
Engineering News Record, Vol 195, No 13, p 10-11, October 2, 1975. 2 tab.

Descriptors: *Construction, *Sewerage, *Waste water treatment, *Treatment facilities, Tertiary treatment, Legislation, Government supports.
Identifiers: Sewerage construction.

A survey of 82 major sanitary districts indicated that they plan to spend more than twice the sewerage construction dollars in fiscal 1976 than in the preceding year. Over half the planned spending is for new or expanded treatment plants, comprising about one-third of all United States sewage construction. Earlier this year, $9 billion is impounded pollution control construction funds were released by the federal government, constituting the legislation of a demand for increased sewerage construction. Of the 82 districts reporting, 34 will have $1.9 billion worth of advanced waste water treatment plants under construction by 1979. The greatest growth in fiscal 1976 from 1975 is shown by the Middle West and Middle Atlantic districts. Southern and far western districts plan growth 60% above fiscal 1975; and 11 districts between the Mississippi River and the Rockies have plans to decrease 1976 spending by 24%. A weakness in the project-distribution is that four big cities' fiscal 1976 and 1977 predictions account for 50% of the total reporting districts. These cities--New York City, Chicago, Detroit, and Los Angeles--have $2.8 billion allotted for sewerage construction in 1976 and 1977. With trends towards higher interest rates required to market bonds, problems with municipal funding may injure the market to construction progress in the next year. (Kramer-FIRL)
W76-01794

PENNSYLVANIA USES CREATIVE APPROACH TO WATER QUALITY MANAGEMENT PLANNING,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Environmental Protection and Regulation.
H. Steigman.
Journal of Environmental Health, Vol 38, No 1, p 45-48, July-August, 1975.

Descriptors: *Water quality, *Administration, Water quality control, Water pollution control, *Pennsylvania, *Comprehensive planning.
Identifiers: Comprehensive Water Quality Management Planning Program.

Pennsylvania is designing a Comprehensive Water Quality Management Planning Program (COWAMP) which will focus on technological, environmental, economic, social and management aspects of water quality management. Results should meet the requirements of the Pennsylvania Clean Streams Law and of PL 92-500. Each of the nine study areas that the state has been divided into will have a Coordinator, Consultant, Policy Advisory Committee, a Technical/Study Advisory Committee, a Department of Environmental Resources regional offices and Areawide Planning Organization. COWAMP will include significant local participation and is of an interdisciplinary nature. A notable feature of COWAMP is its consideration of alternative environmental futures; this will consist of an environmental inventory of assets and values present in any given area, followed by the establishment of objectives and policies concerning the said values and assets. Present waste water management services in Pennsylvania are constraining and create financial inequities between neighboring areas. COWAMP's financial designs will be fully incorporated into the physical system alternatives. In this manner, it will be possible to create a financial maintainable system. (Waltner-FIRL)
W76-01796

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART I, EFFECT OF THE 'REVIEW AND COMMENT PROCESS' ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01800

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01801

THE WILLAMETTE RIVER GREENWAY: CULTURAL AND ENVIRONMENTAL INTERPLAY,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 6G.
W76-01805

PREDICTING THE PERFORMANCE OF FEEDLOT CONTROL FACILITIES AT SPECIFIC OREGON LOCATIONS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
R. B. Wensink, and J. R. Miner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 559, $4.50 in paper copy, $2.25 in microfiche. Report WRRI-34, August 1975. 56 p, 3 fig, 10 tab, 8 ref, 2 append. OWRT A-028-ORE(1).

Descriptors: Effluents, Feedlots, Mathematical models, *Oregon, *Forecasting, *Farm wastes, *Agricultural runoff, Model studies, Water pollution control, Treatment facilities, Waste treatment, *Performance.
Identifiers: *Feedlot runoff.

In 1972 the United State Congress enacted the 'Federal Water Pollution Control Act Amendments of 1972'. This Act required the Environmental Protection Agency to promulgate effluent guidelines for discharges from feedlots. These guidelines permit discharge from feedlots only in connection with an 'unusual rainfall' event. For 1977, the criterion is the 10 year-24 hr storm; for 1983, the criterion is the 25 year-24 hr storm. These criteria, however, are performance standards and do not represent reservoir design. A mathematical simulation model was developed to size feedlot runoff retention reservoirs based upon previous climatological records. Two versions of the model were programmed. The first, called the return period design technique, investigated the results of employing EPA's performance standards as design criteria. The second model, entitled the sufficient design method, determined the minimum reservoir storage volume required to prevent illegal discharge as defined by the EPA Effluent Guidelines. The two techniques demonstrated that to use design procedures based upon a factor times the 10 year-24 hour or the 25 year-24 hour storm led to designs that were either unreasonably expensive or which led to illegal discharges for which the livestock producer was subject to monetary penalties.
W76-01807

DISPOSAL OF MARINE SEWAGE: AN ENVIRONMENTAL MANAGEMENT STANDARD FOR NAVAL SHIPS,
Naval Undersea Center, San Diego, Calif.
C. A. Farrell, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-752 761, $3.50 in paper copy, $2.25 in microfiche. Report NUC TP 323, June 1972. 16 p, 8 tab, 6 ref, 1 append.

Descriptors: *Water pollution, *Sewage disposal, *Harbors, *Ships, Sewage treatment, Regulation, Standards, Cost analysis, Cost comparisons, Cost-benefit analysis, Bays, Estuaries, Waste disposal, Waste water disposal, Waste water(Pollution).
Identifiers: *Marine sewage.

Information on the problem of vessel waste disposal was provided, the Environmental Protection Agency's proposed secondary treatment standard for marine sanitary devices was reviewed, and an alternate standard for U.S. Navy ships was recommend. The alternate standard, based on environmental management considerations, would permit Navy ships to discharge raw sewage overboard while in transit but would require all sewage, human and domestic, to be pumped ashore while ships are moored. Under the alternate standard the contribution of Navy ships to

biological oxygen demand and suspended solids in United States harbors would be reduced by approximately 95%, whereas the EPA standard will achieve a reduction of less than 70%. In addition the alternate standard would reduce by an estimated 68% of 19.7 million dollars annually the planned cost to the Navy of meeting the EPA standard by installing a sewage holding system on naval ships. (Sims-ISWS)
W76-01828

REMOTE SENSING OF COAL MINE POLLUTION IN THE UPPER POTOMAC RIVER BASIN.
Ambionics, Inc., Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-01831

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, APPENDIX II,
Ocean Systems, Inc., Reston, Va.
F. A. March, R. L. Beach, R. P. Bishop, T. H. Blockwick, and R. K. Sahgal.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-759 524, $10.00 in paper copy, $2.25 in microfiche. Final Report 724103.06.1, February 1972. 358 p, 110 fig, 28 tab, 15 ref, 5 append. DOT-CG11,542A.

Descriptors: *Oil spills, *Model studies, *Laboratory tests, Oil, Waves(Water), Barriers, Evaluation, Hydraulic models, Oceans, Weirs, Research and development, Equipment, Pump testing, Pumps, Oil production, Water pollution control.
Identifiers: *Oil spill recovery.

A model test development program was conducted of a double weir oil recovery system for rapid recovery of oil spilled on the high seas. The tests conducted showed the recovery system to be capable of recovering spilled oil at high efficiencies (less than 10% water in the recovered oil) at a 200 gpm flow rate under environmental conditions ranging from calm to low State 5 seas (8' significant wave height) and in currents up to 3 knots. The system efficiency was relatively independent of oil specific gravity, viscosity, oil film thickness, wind and wave conditions, oil-water interfacial tension, surface temperatures, and variation in significant oil type when towed at speeds of 1 to 3 knots. Efficiencies of 90-100% can be expected under these conditions. The system effectiveness (oil flow rate) was relatively independent of wind and wave conditions, surface temperature, oil specific gravity, oil-water interfacial tension, and significant oil type variation. The effectiveness of the weir/basin unit was not affected by viscosities in excess of 100,000 centistrokes, but the oil transfer system effectiveness dropped below 2000 gpm for oil viscosities in excess of 2-3000 centistrokes. A detailed discussion of three-dimensional seakeeping tests, pump and control system tests, 1/3-scale model tests with oil, tradeoff studies and system design drawings were presented. (See also W75-09660) (Humphreys-ISWS)
W76-01835

ACTIVITIES AND NEEDS RELATED TO RADIOACTIVITY STANDARDS FOR ENVIRONMENTAL MEASUREMENTS.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W76-01861

UP-DIP VERSUS DOWN-DIP MINING, AN EVALUATION,
Skelly and Loy, Harrisburg, Pa.
J. W. Mentz, and J. B. Warg.
Environmental Protection Agency, Report EPA-670/2-75-047, June 1975. 73 p, 12 fig, 9 tab, 8 ref. 1BB040; ROAP 61AAD; Task 016. 68-01-0465.

Descriptors: Water quality, *Coal mines, Cost comparisons, *Water pollution, Mine waters, Ground water, Drainage, *Evaluation, Feasibility studies, Water quality standards.
Identifiers: *Mining methods, Down-dip mines, Up-dip mines.

Detailed results are presented of a feasibility study of down-dip mining, a technique that appears to offer an alternative to sealing or permanent treatment of polluted effluents from coal mines after abandonment. The project included an evaluation of a pair of nearly identical abandoned underground mines - one developed to rise, one developed to dip - to confirm the theory that discharge water quality in down-dip mines is substantially better than that in up-dip mines. An active mine with units operating up-dip and down-dip was also evaluated to ascertain economic and engineering limitations, costs in varying situations, and other major advantages or disadvantages of each mode of operation. Health and safety and National water quality and economic impacts of widespread use versus non-use of the technique were also assessed. (EPA)
W76-01868

METHODS TO TREAT, CONTROL AND MONITOR SPILLED HAZARDOUS MATERIALS,
Calspan Corp., Buffalo, N.Y.
R. J. Pilie, R. E. Baier, R. C. Ziegler, R. P. Leonard, and J. G. Michalovic.
Environmental Protection Agency, Report EPA-670/2-75-042, June 1975. 137 p, 33 fig, 27 tab, 4 ref. 1BB041; ROAP 21AVN; Task 033. 68-01-0110.

Descriptors: *Water treatment, *Activated carbon, *Gelation, *Waste water treatment, Biology, Neutralization, Monitoring, Bioassay.
Identifiers: Hazardous materials spill, Hazardous chemical spills, Cyclic colorimeter, Universal gelling agent.

The feasibility of treating, controlling and monitoring spills of hazardous materials was studied. Emphasis was placed on considering techniques and equipment which would be applicable to general classes of chemicals rather than to specific hazardous polluting substances. Several methods were found to be promising for removing or detoxifying spills of hazardous chemicals 'in-situ'. These included: the use of sodium sulfide as a precipitating agent for spills of heavy metal ion solutions; the use of activated carbon packaged in porous fiber bags (carbon 'tea bags') for adsorbing a wide variety of soluble organic chemicals; and the use of various acids or bases to neutralize spills. Methods were studied to control spills on land and prevent their contaminating nearby surface or ground water. A four-component 'universal gelling agent' was developed to immobilize a spilled liquid. A 'cyclic colorimeter', a novel heavy metal ion detector, was perfected and laboratory tested, and a detection kit capable of sensing several chemicals was developed. A computer model was developed and refined to simulate the spread of a spill when certain stream parameters and material characteristics are known. Bioassay studies were conducted for several chemicals using at least three species of biota. In addition, bioassays were conducted to estimate the environmental effect of each of the various treatment methods developed. (EPA)
W76-01869

WATER QUALITY CONTROL IN MINE SPOILS, UPPER COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins.
D. B. McWhorter, R. K. Skogerboe, and G. V. Skogerboe.
Environmental Protection Agency, Report EPA-670/2-75-048, June 1975. 99 p, 13 fig, 10 tab, 20 ref, 7 append. 1BB040; ROAP 21BDU; Task 02. R802621.

Descriptors: Coal mines, *Strip mining, Waste disposal, Drainage, Mine waters, *Water pollution, Water quality, *Groundwater, Water chemistry, Salinity, Soil chemistry, Solubility, Runoff, *Colorado River Basin.
Identifiers: Strip mine wastes, Upper Colorado River Basin.

The purpose was to identify potential water quality problems associated with runoff and percolation through mine spoils at selected sites in the Upper Colorado River Basin. The results show that the production of soluble salts from mine spoils into receiving waters is probably the most significant water quality problem that can be expected. No significant release of heavy metals was observed in the coal mine spoils studied. Some significant heavy metal concentrations were observed in the stream below the tailings disposal area from a copper-lead-zinc mill. A portion of these metals is contributed by the tailings, but a variety of old mines and mine dumps also make a contribution. The quality of percolate and runoff from spoils corresponds to the constituents of extracts prepared from saturated pastes of the spoil material. A method of estimating salt production into receiving waters was derived and found to agree very well with measured salt pickup at one coal site. The minimum quantities of salts that will eventually be released from the spoils studied are estimated. (EPA)
W76-01870

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1974 - FEBRUARY 1975,
California Univ., Santa Barbara. Marine Science Inst.
F. A. DeWitt, Jr., and P. Melvin.
Environmental Protection Agency, Report EPA-670/2-75-044, May 1975. 260 p. 1BB041; ROAP 21BEA; TASK 008. R-803063.

Descriptors: *Bibliographies, *Oil spills, *Oil pollution, Patents, Water pollution control, *Documentation, Pollution abatement, *Research and development.
Identifiers: *Oil spill events.

The November 1974 - February 1975 Oil Spill and Oil Pollution Reports is the second quarterly compilation of oil spill events and oil pollution report summaries. Presented are: (a) summaries of oil spill events; (b) summaries and bibliographic literature citations; (c) summaries of current research projects; and (d) patent summaries. (See also W76-01873 and W75-07689) (EPA)
W76-01872

OIL SPILL AND OIL POLLUTION REPORTS FEBRUARY 1975 - APRIL 1975,
California Univ., Santa Barbara. Marine Science Inst.
F. A. DeWitt, Jr., and P. Melvin.
Environmental Protection Agency, Report EPA-670/2-75-059, June 1975. 234 p. 1BB041 (ROAP 21BEA, Task 008). R-803063.

Descriptors: *Bibliographies, *Oil spills, *Oil pollution, *Patents, Water pollution control, Documentation, Pollution abatement, Research and development.
Identifiers: Oil spill events.

This report is the third quarterly compilation of oil spill events and oil pollution report summaries. Presented are: (a) summaries of oil spill events; (b) summaries and bibliographic literature citations; (c) summaries of current research projects; and (d) patent summaries. (See also W76-01872 and W75-07689) (EPA)
W76-01873

CONTROLLING SULFIDES IN SANITARY SEWERS USING AIR AND OXYGEN,
R. J. Sewell.

Environmental Protection Agency, Report EPA-670/2-75o060, June 1975. 111 p, 27 fig, 22 tab, 56 ref. 1BB043 (ROAP 21ASW, Task 008). 11010 DYO.

Descriptors: *Odor, Corrosion control, Hydrogen sulfide, *Aeration, Oxygen, Sewers.
Identifiers: *Sulfide control, U-tubes, Pressure tanks, Lift stations, *Odor control, Force mains, Diffusers.

Ambient sulfide conditions and corrosion rates in a sanitary sewerage system are described, and results are presented of a study that demonstrated that the use of air or pure oxygen is effective in controlling sulfides. The three techniques used to entrain the gases in the sewage included injection, U-Tubes, and pressure tanks. Sulfide control was evaluated at eight separate locations involving lift stations, force mains, and receiving gravity lines. The entrainment techniques studied were not optimized. However, odor and corrosion problems were abated. Preliminary cost data indicated that air injection into force mains, and the use of air with the U-Tube were the least costly sulfide control measures. (EPA)
W76-01877

AQUATIC HERBICIDES AND THE CONTROL OF WATER WEEDS,
Cambridge Univ. (England). Dept. of Applied Biology.
M. P. Brooker, and R. W. Edwards.
WATER Research, Vol 9, No 1, p 1-15, January 1975. 7 tab, 2 fig, 136 ref.

Descriptors: *Aquatic weed control, *2-4-D, *Dalapon, *Diquat, *Paraquat, *Herbicides, *Food webs, *Biological communities, *Aquatic flora, *Water quality, *Environmental effects, 2-6-dichlorobenil, Aquatic fauna, Toxicity, Dissolved oxygen, Plant growth regulators.
Identifiers: *Maleic hydrazide.

The application of herbicides for the control of aquatic plants produces two groups of effects. The primary or direct effects result from the spectrum of toxic action of the herbicide itself on aquatic and, after abstraction, terrestrial organisms. The secondary or indirect effects result from the death of the plants, and consequent changes in the physical, chemical and biological nature of a treated water body, changes which may interfere with abstracted uses. Such effects are reviewed, particularly where they constrain other water resource uses or differ from effects resulting from cutting and removal. Concerning direct effects, the losses of aquatic herbicides from water and their toxicity to mammals, aquatic fauna and crop plants are considered together with the implications of different methods of herbicide application. Possible methods of removing aquatic herbicides from water supplies are described. The major ecological changes following the use of aquatic herbicides are indirect resulting from the destruction of the aquatic plants. The death and decay of submerged aquatic plants is likely to perturb the oxygen-carbon dioxide balance of the water and other changes in water quality are likely to occur. Loss of habitat and changes in available food resources may result in changes in the aquatic fauna. Replacement growths of plants (macro- or micro) may cause problems in relation to drainage functions, water abstractions and recreational facilities. (Katz)
W76-01911

HYDROGEN PEROXIDE AS A SOURCE OF OXYGEN SUPPLY IN THE TRANSPORT OF FISH FRY,
Institute of Science, Nagpur (India). Dept. of Zoology.
V. B. Marathe, N. V. Huilgol, and S. G. Patil.
The Progressive Fish-Culturist, Vol 37, No 2, p 117, April 1975.

Descriptors: *Dissolved oxygen, *Water quality, Fry, Transportation, Fish stocking, Methodology.
Identifiers: *Hydrogen peroxide, Cyprinus carpio.

Hydrogen peroxide was a good agent for replenishing the dissolved oxygen of water during the transport of fish fry provided it was used so that the dissolved oxygen value of water did not exceed the normal requirement of the fry. Hydrogen peroxide was harmful if used indiscriminately and predetermination of the dosage was advised. (Klein)
W76-01931

THE INFLUENCE OF EMBANKMENTS ON THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN THE ARCHIPELAGO OF FOGLO, ALAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-01940

COMPREHENSIVE WETLANDS PROTECTION: ONE STEP CLOSER TO FULL IMPLEMENTATION OF SECTION 404 OF THE FWPCA.
For primary bibliographic entry see Field 6E.
W76-01955

ANTITRUST AND POLLUTION CONTROL: AN EPA PERSPECTIVE,
Environmental Protection Agency, Washington, D.C. Office of General Counsel.
R. V. Zener.
University of Pittsburgh Law Review, Vol 36, No 3, p 705-714, 1975. 10 p, 30 ref.

Descriptors: *Research and development, *Research facilities, Technology, *Water pollution control, *Air pollution effects, Research priorities, Pollution abatement, Water pollution treatment, Legal aspects, Constraints, Regulation, Penalties(Legal), Water, Water law, Environmental effects, Legislation, Law enforcement.
Identifiers: *Antitrust laws, *Consumers.

There has been considerable discussion concerning the application of antitrust laws to joint research and development for pollution control. A basic premise of the antitrust laws is that competition is the best stimulus for product improvement. Consumers generalyy are willing to absorb the cost of research when it leads to a more efficient product; and industry, in turn, is willing to engage in such research to realize a competitive advantage. The proponents of joint research for pollution control, however, argue that this premise does not apply where the gains from research are largely social. Consequently, they urge, joint research and development may be the only realistic method for the realization of social benefits. Nevertheless, problems would exist if such joint ventures were expected from antitrust regulation. For example, it would be unthinkable to allow companies engaged in development and sale for profit of pollution control equipment to engage in joint research outside the reach of antitrust laws. Another potential problem is that when there is no competitive advantage to the development of innovative technology, a conspiracy to retard development is obviously easier to maintain. Additional arguments, pro and con, are presented concerning whether joint research and development for pollution control should be subject to antitrust laws. (Hoffman-Florida)
W76-01958

WATER QUALITY STANDARDS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PRODUCTIVE BUT UNREALISTIC,
S. F. Unger.
Gonzaga Law Review, Vol 10, No 1, p 165-180, 1974. 16 p, 89 ref.

Descriptors: *Economic feasibility, *Adoption of practices, *Federal Water Pollution Control Act, *Water quality standards, *Industrial wastes, Regulation, Technology, Effluents, Political aspects, Economic impact, Economic efficiency, Tangible benefits, Water pollution treatment, Waste treatment, Waste disposal, Economic justification, Water quality, Federal government, Planning, Legislation, Technology.
Identifiers: *Effluent limitations, Point sources(Pollution), Funding, *Federal Water Pollution Control Act Ammendemnts of 1972.

The emphasis of the Federal Water Pollution Control Act Amendments of 1972 is primarily on treatment, by the best technology available, of discharges at specific point sources. The Amendments provide a two step process for the achievement of the required effluent levels. Phase One requires industries to utilize by 1977 the practicable control technology currently available. Phase Two extends to 1983 and requires industry either to achieve no discharge or to utilize the best available technology economically achievable. These new standards will require drastic expenditures by some companies since 'best available technology' refers to the best performing company in a particular industrial category, while 'best practicable technology' refers to the average of the most efficient performers. Barriers to full compliance with the 1972 Amendments explored here include: (1) high costs; (2) insufficient federal funding for research and construction; (3) industry opposition; and (4) the political effects of Watergate on the nation's pollution control programs. While the 1972 Amendments will doubtless have a beneficial effect on the nation's waterways, it is arguable that the water quality standards required will create costs far greater than any social benefits resulting. (Hoffman-Florida)
W76-01959

THE FUTURE OF ENVIRONMENTAL DEFENSE,
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-01961

IMPROVEMENT OF THE QUALITY OF WATER SUPPLY SOURCES (POLICY STATEMENT OF AMERICAN WATER WORKS ASSOCIATION).
For primary bibliographic entry see Field 6E.
W76-01962

THE SAFE DRINKING WATER ACT AND EPA'S ROLE IN TRAINING,
Environmental Protection Agency, Washington, D.C., Division of Water Supply.
J. H. McDermott.
Journal of the American Water Works Association. Vol 67, No 8, p 441-42, August, 1975. 2 p, 1 illus, 2 ref.

Descriptors: *Potable water, *Training, *Education, *Scientific personnel, *Public utilities, Legislation, Public health, Environmental sanitation, Occupations, Personnel, Personnel management, Water supply development, Water utilization, Water conservation, Domestic water, Water quality, Water purification, Water pollution, Governmental interrelations, Economics, Costs, Cost allocation, Federal government, State governments.
Identifiers: *Safe Drinking Water Act.

The Safe Drinking Water Act recognizes the sizeable training needs exist for community water-supply systems personnel and that such needs can be met only by a cooperative federal, state, local effort utilizing the capabilities of both public and private sectors. For example, the 1970 Community Water Supply Study indicates that 63% of operating personnel have no formal training in sanitary microbiology and, for systems that provide treat-

ment other than disinfection, 46% have no formal training in chemistry. In addition, estimates indicate that personnel in state water-supply positions will have to be increased ten-fold in order to support optimum state programs. The Environmental Protection Agency will have primary responsibility in developing and supporting training programs. The cost of this training will include direct costs, for providing the programs themselves, and indirect costs, such as the higher salaries that will be needed to attract and retain qualified personnel. However, because this training workload will be so formitable, it is clear that the major costs must be borne not by the EPA, but by the utility itself as a basic cost of doing business. (Hoffman-Florida)
W76-01963

CRIMINAL PROSECUTION UNDER THE ALASKA ENVIRONMENTAL CONSERVATION ACT OF 1971: STOCK V STATE,
T. D. Taron.
UCLA-Alaska Law Rev, Vol 4, No 4, p 387-418, 1975, 32 p, 177 ref.

Descriptors: *Alaska, *Environmental control, *Water pollution control, *Penalties(Legal), *Law enforcement, Legislation, Regulation, State jurisdiction, Legal aspects, Water law, Water policy, Judicial decisions, Drainage, Potable water, Public health, State governments, Water pollution sources.
Identifiers: *Criminal law, Orders, Directives.

The Alaska Environmental Conservation Act was enacted in 1971 to halt environmental degradation. The purpose of this Comment is to inform Alaskans of the criminal sanctions embodied in the state's environmental control law. A schematic examination of the criminal provisions of the Act reveals the types of conduct prescribed by the law. In general, the provisions fall into three categories; violation of department orders and directives, specific prohibitions, and the general prohibition statute. Department orders contain provisions for determining when an order may issue, and when that order becomes effective. Specific prohibitions include regulations promulgated by the department and statutory prohibitions drafted by the legislature. The general prohibition statue consists of a single provision which broadly prescribes pollution in general and makes polluters strictly liable for any violations. Finally, some of the Act's more important criminal provisions are examined in light of the recent Alaska Supreme Court case, Stock v State in which corporate officials were held responsible for the drainage of raw sewage into waters reserved for drinking purposes. (Hoffman-Florida)
W76-01967

WATER MANAGEMENT IN ONTARIO--AN ECONOMIC EVALUATION OF PUBLIC POLICY,
British Columbia Univ., Vancouver. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-01969

TOWARD AN INTERNATIONAL STANDARD OF ENVIRONMENT,
Georgetown Univ., Washington, D.C. School of Law.
For primary bibliographic entry see Field 6E.
W76-01970

TEST CASE ON OCEAN DUMPING: MUST PHILADELPHIA MOVE TOWARD ON-LAND DISPOSAL OF SEWAGE SLUDGE.
Environmental Law Reporter, Vol 5, No 9, p 10144-10147, 1975, 4 p.

Descriptors: *Waste disposal, *Pennsylvania, *Waste dumps, *Sea water, *Permits, Solid wastes, Waste water disposal, Sludge, Industrial wastes, Organic wastes, Administrative decisions, Administration, Administrative agencies, Law enforcement, Legal aspects, Ultimate disposal, Water pollution control, Legislation, Public health, Environmental effects, Water quality control, Standards.
Identifiers: *Ocean dumping, *Land-based waste disposal, *Philadelphia(Penn).

The Marine Protection, Research, and Sanctuaries Act of 1972 was passed to regulate the dumping of all types of materials into ocean waters and to prevent or restrict the dumping of harmful materials into ocean waters. Discussed here is a statute requiring the design and implementation of land-based waste disposal projects. To help achieve this goal the Administrator of the Environmental Protection Agency (EPA) has the discretion to issue interim permits for ocean dumping to those who have started the sometimes long process of implementing land-based waste disposal. Until recently, the EPA has been lax in enforcing permit requirements. In 1975, however, the EPA ordered Philadelphia to cut all ocean sludge dumping in half by 1979, and to end it completely by 1981. The city has asked that this regional decision be reviewed by the Administrator. The Administrator's ruling, to be delivered in the fall of 1975, should have a significant impact on the future of land based waste disposal projects.
W76-01971

E L I CONCLUDES WATER ACT ENFORCEMENT STUDY.
Environmental Law Reporter, Vol 5, No 9, p 10158-10161, 1975, 4 p.

Descriptors: *Federal Water Pollution Control Act, *Administrative agencies, Law enforcement, *Coordination, *Adjudication procedure, Water law, Water policy, Legal aspects, Penalties(Legal), Water quality control, Decision making, Governmental interrelations, Remedies, Administration, Regulation, Administrative decisions, State governments, Social aspects, Water pollution control, Water management.
Identifiers: Administrative remedies, Judicial remedies.

Law enforcement under the Federal Water Pollution Control Act Amendments of 1972 was the topic of a recent study by the Environmental Law Institute (ELI). This article presents a summary of the Institute's findings and summaries. The study found that pollution control agencies were reluctant to issue warnings and orders and generally preferred to use informal cooperation when dealing with dischargers. While such cooperation was generally beneficial, it was sometimes found to result in inconsistent decisions which often created internal conflict over enforcement policies. The study also found that administrative remedies are generally more productive than judicial remedies in dealing with dischargers. A major advantage of administrative action is that it is quick and inexpensive. In addition, it allows the agency to work with the discharger. Litigation, on the other hand, is time-consuming, expensive, and often provokes a discharger to assume a combative attitude that further delays compliance. A review of inter- and intra-governmental relations found cooperation between the Environmental Protection Agency, United States Attorneys, and the Justice Department to be good. Relations between state water pollution agencies and state attorney generals, however, were frequently found to be poor. (Hoffman-Florida)
W76-01972

MORELAND V ACADIAN MOBILE HOMES PARK,' INCORPORATED (INTERFERANCE WITH NATURAL DRAINAGE).
For primary bibliographic entry see Field 6E.
W76-01974

SUN ENTERPRISES, LTD V TRAIN (DREDGING AND SEWAGE DISPOSAL IN WETLANDS).
For primary bibliographic entry see Field 6E.
W76-01976

UNITED STATES V RESERVE MINING COMPANY (DISCHARGE OF TACONITE TAILINGS INTO LAKE SUPERIOR).
For primary bibliographic entry see Field 6E.
W76-01977

P F Z PROPERTIES, INC V TRAIN (DREDGING AND DEVELOPMENT OF MANGROVE WETLANDS).
For primary bibliographic entry see Field 6E.
W76-01978

COMMITTEE TO SAVE LAKE MURRAY V. FEDERAL POWER COMM'N (DISCHARGE OF TREATED EFFLUENT INTO LAKE).
For primary bibliographic entry see Field 6E.
W76-01981

UNITED STATES V. INDEPENDENT BULK TRANSPORT (OIL SPILL DAMAGES),
For primary bibliographic entry see Field 6E.
W76-01984

PUBLIX SUPER MARKETS, INC V PEARSON (FILLING OF WATER FILLED PHOSPHATE PITS).
For primary bibliographic entry see Field 6E.
W76-01985

WATER CONTROL (REGULATING POLLUTION AND DISCHARGE OF UNTREATED WASTES INTO MISSISSIPPI RIVER).
For primary bibliographic entry see Field 6E.
W76-01987

CITIES SERVICE COMPANY V. STATE OF FLORIDA (ACTION BY STATE FOR DAMAGES AND INJUNCTIVE RELIEF ARISING OUT OF BREAK IN DAM IMPOUNDING PHOSPHATE SLIME).
For primary bibliographic entry see Field 6E.
W76-01988

SOCIETY FOR PROTECTION OF NEW HAMPSHIRE FORESTS V. SITE EVALUATION COMMITTEE (APPEAL BY GROUP OPPOSING LOCATION OF NUCLEAR GENERATING FACILITY ALLEGING ADVERSE AFFECT ON WATER QUALITY).
For primary bibliographic entry see Field 6E.
W76-01990

MARINE POLLUTION-PREVENTION-WASTES, ETC.
For primary bibliographic entry see Field 6E.
W76-01992

BURGESS MINING AND CONSTRUCTION CORPORATION V. STATE EX REL BAXLEY (ACTION BY STATE FOR DAMAGES RESULTING FROM MINING COMPANY'S ALLEGED POLLUTING OF RIVER).
For primary bibliographic entry see Field 6E.
W76-01993

NATURAL RESOURCES DEFENSE COUNCIL, INC. V. TRAIN (FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS).
For primary bibliographic entry see Field 6E.
W76-01995

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

HIERACHICAL MANAGEMENT OF GROUND AND SURFACE WATER SYSTEM VIA MULTICELL APPROACH,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4A.
W76-01501

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert School of Industrial Administration. Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01508

A SIMULATION APPROACH TO THE ANALYSIS OF UNCERTAINTY IN PUBLIC WATER RESOURCES PROJECTS,
Georgia Univ., Athens, Inst. of Natural Resources.
For primary bibliographic entry see Field 6B.
W76-01510

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SIXTH VOLUME.
Office of Water Research and Technology, Washington, D.C.
Available from the National Technical Information Service Springfield, Va 22161 as PB247-098, $12.50 in paper copy, $2.25 in microfiche. Water Resources Scientific Information Center, OWRT/WRSIC 75-201, September 1975, 481 p. Edited by Daniel P. Loucks, Cornell University, Ithaca, New York.

Descriptors: *Systems analysis, *Bibliographies, *Water resources, Development, **Optimization, Simulation analysis, Operations research, Abstracts, Planning, Management, Alternative planning.

This is an annotated bibliography consisting of 301 abstracts of selected publications issued in 1973 and 1974 pertaining to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. The first two volumes of this bibliography, having the same title, were published by the Cornell University Water Resources and Marine Sciences Center, Ithaca, New York (Publication 25, August 1969; Publication 35, June 1971); the third, fourth and fifth volumes were published by the Water Resources Scientific Information Center in December 1972, December 1973, and July 1974, respectively. Both subject and author indexes are provided. Descriptors are listed with each abstract. The abstracted material emphasizes the application of optimization and simulation techniques for assisting the planning and management of water resource systems. (See also W75-11574).
W76-01517

TOWARDS SYSTEM MODELS FOR WATER RESOURCE MANAGEMENT--A COMMENT,
Department of the Environment, London (England). Systems Analysis Research Unit.
P. G. O'Neill.
Journal of Environment Management, (U.K.), Vol 2, No 1, p 79-82, 1974. 4 ref.

Descriptors: *Mathematical models, Water resources, Planning, Optimization, Model studies, Decision making, *Reviews.
Identifiers: State-of-the-art, England.

The effectiveness of system models in water resources management is considered. Models seeking minimal operating costs have found some limited use for linear programming formulations, primarily where sources are mainly groundwater. Generally, however, the non-linearity of the physical relations involved has lead researchers to prefer dynamic programming, or hill-climbing methods using simulation of sub-programs. Models have been used to derive the optimal costs relationship, discounting, and evaluating initial underutilization of a system. Dynamic programming has not been of great help in resource management because of the problem of dimensionality but has proved useful in the determination of the optimal combination of effluent-treatment and water-treatment plants along the course of a river and could potentially be used for both waste disposal and public water supply. Systems models can and do offer useful guidance to the implications of alternative philosophies of management, but the real issues in water resource management are political and their resolution requires many interdisciplinary skills. While it is tempting to aim at the optimization of system development and control in terms of maximizing net social welfare even this objective is deterred by the absence of any objective criterion for the distribution as opposed to the allocative implications of a strategy. (Auen-Wisconsin)
W76-01603

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01616

BAYESIAN INFERENCE AND DECISION MAKING FOR EXTREME HYDROLOGIC EVENTS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-01761

THE SANTA ANA RIVER BASIN: AN EXAMPLE OF THE USE OF COMPUTER GRAPHICS IN REGIONAL PLAN EVALUATIONS.
Steinitz Rogers Associates, Inc., Cambridge, Mass.
IWR Contract Report 75-3, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, June 1975. 290 p, 117 fig, 10 tab, 27 ref.

Descriptors: *Watersheds(Basins), *Planning, *Computer programs, Methodology, Graphical methods, Land use, Evaluation, Effects, Alternative planning, Water resources, Decision making, Forecasting, Regions, Systems analysis.
Identifiers: *Computer graphics, *Upper Santa Ana River basin(Cal), Environmental impact studies, Data bank, Land use patterns, Locational attractiveness models, Matrix models, Weighted indices.

Solutions to most problems of watershed management require large amounts of information regarding natural resources, land use, and social needs. This report explores the possibilities of computer graphics as a tool in the process of watershed planning. Considered is a research project involving a study of the Upper Santa Ana River Basin in California and addressing techniques for predicting future land use patterns, analyzing the effects of future land use on resources, identifying desirable alternative plans for resource development, and applying these methods toward the generation of environmental impact studies, particularly for regional-scale development decisions. The project consisted of the creation of a computerized data bank of site resources and land use elements, the development of locational attractiveness models defined by major activities or land uses occurring in the basin and the identification of the criteria which define land use decisions, the analysis of the vulnerability of various natural systems to impacts caused by future land use change, and the analysis of the attractiveness models and the impact models by evaluating two locally specified land use plans. Weighted indicies were used to evaluate land use locations, matrix models to evaluate the resource impacts of land use patterns, and computer programming to relate the model information to specific land areas. The GRID computer program (Harvard University, 1968) accomplished data organization, analysis, and display. (Bell-Cornell)
W76-01899

6B. Evaluation Process

WATER QUALITY CONTROL AND BUSINESS BEHAVIOR, WISCONSIN UNIV., MADISON. GRADUATE SCHOOL OF BUSINESS ADMINISTRATIONS,
Wisconsin Univ., Madison. Graduate School of Business Administration.
For primary bibliographic entry see Field 5G.
W76-01505

A SIMULATION APPROACH TO THE ANALYSIS OF UNCERTAINTY IN PUBLIC WATER RESOURCES PROJECTS,
Georgia Univ., Athens, Inst. of Natural Resources.
B. W. Taylor, and R. M. North.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-114, $5.00 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC 1375, September 1975, 73 p, 4 fig, 10 tab, 57 ref. OWRT A-052-GA(1). 14-13-31-0001-4010.

Descriptors: *Evaluation, *Project feasibility, *Project planning, *Benefits, *Costs, *Risks, *Simulation analysis, Georgia, Estimating, Investment, Monte Carlo method, Cost-benefit ratio.
Identifiers: Spewrell Bluff Project(Geo).

The existing economic criteria for evaluating water resource projects are deterministic and therefore incomplete since these criteria do not include any consideration of uncertainty of possible outcomes. A Monte Carlo simulation approach was used to generate values for a mean and a standard deviation for the benefits, costs, benefit-cost ratios and net present values for the Spewrell Bluff Project in Georgia to demonstrate the variability of probable outcomes from investing public funds in the project. A triangular distribution of most likely, most optimistic, and most pessimistic estimates of project managers within the Corps of Engineers formed the basis for the simulation. Additional estimates were obtained from outside sources for comparative estimates of project variability and as a test for the internal estimates. Comparable measures of expected mean values and variability of outcomes for all projects could lead to better investment decisions and reduced controversy over water resource projects.
W76-01510

PLANNING FOR COASTAL RECREATION OPPORTUNITIES NEAR LARGE URBAN AREAS: A STUDY RELATING TRANSPORTATION AND RECREATION,
INTASA, Menlo Park, Calif.
D. P. Lijesen, Y. Snir, J. Rosing, and K. Skurski.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-129, $5.50 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 110 p, 15 fig, 18 tab, 23 ref, 2 append. OWRTC-5213(No. 4234)(1).

Descriptors: *Transportation, *Recreation, *Access routes, Recreation demand, Planning, Coasts, Methodology, Competing uses, Water resources development, Planning coordination,

Long-term planning, Estimated benefits, Comparative benefits, Comparative costs, Computer model, Pacific coast region, *California, Beaches, Reasonable use, Environmental effects.
Identifiers: California central coastal zone, Sensitivity analysis, Comparative analysis, Recreation and transportation plans, Recreation accessibility model, Public information, Recreation planning scenarios.

Recreation research is traditionally either behavior-oriented or directed towards methodologies for economic benefit evaluation of recreation projects; recreation planning generally produces a document indicating how, when and where recreation opportunities are to be provided. General recreation research and functional planning are seldom mutually influential nor do they provide the basis for informed decision making by the public. The thrust of this research was to identify the type of information that the recreation planner should develop during the planning process in order to formulate plans that include the issues of concern to people who will ultimately accept or reject a plan. A sensitivity approach is proposed to develop information on level and geographic distribution of recreational visitation, a key input towards determining the final implications associated with recreation plans. An approach is presented for modeling the accessibility of recreation resources as a function of demand for activities, supply of opportunities, and the highway network connecting demand centers and supply zones. The specific case of planning for coastal recreation opportunities along the California Central Coastal Zone near the San Francisco-Oakland-San Jose and Fresno metropolitan areas was used to demonstrate the usefulness of the methodology in functional recreation planning.
W76-01516

AMES RESERVOIR ENVIRONMENTAL STUDY, SUMMARY REPORT.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 4A.
W76-01522

A WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY BASIN, PART 1.
For primary bibliographic entry see Field 5G.
W76-01593

A WATER QUALITY CONTROL PLAN FOR SAN FRANCISCO BAY BASIN, PART 2.
For primary bibliographic entry see Field 5G.
W76-01594

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING BENEFITS OF PROTECTING URBAN FLOOD PLAINS,
Washington Univ., St. Louis, Mo., Inst. for Urban and Regional Studies.
E. Greenberg, C. L. Leven, and A. Schlottmann.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-005 226, $5.50 in paper copy, $2.25 in microfiche. Prepared for Army Engineer Institute for Water Resources, Fort Belvoir, Va. Final report, November, 1974. 104 p, 5 fig, 7 tab, 23 ref, 3 append. DAWC-31-74-C-0054.

Descriptors: *Cost-benefit analysis, *Estimated benefits, *Environmental effects, *Regression analysis, *Model studies, *Flood plains, *Linear programming, Intangible benefits, Social aspects, Research and development, Land use.
Identifiers: Urban flood plains, Land values, General equilibrium locational model, INTASA model, Weisz model, St. Louis(Mo), Urban studies.

Flood control projects have been developed based on the sole criteria of benefits exceeding costs by determining present value of all benefits and costs, determining the effective life of the project and estimating construction and land value costs. Various complications result, particularly estimating the stream of expected benefits which is the focus of this report. From the theoretical model developed and a review of relevant literature, it was concluded that subject to problems caused by externalities, benefits of flood plain protection can be appropriately measured by direct estimation or by examining changes in site values of affected areas. To develop this general equilibrium locational model, two methodological studies using locational measures, INTASA-and Weisz, are reviewed and the empirical techniques applied to their methodologies are criticized. Having a similar conceptual model which uses changes in land values in the final analysis, both models have serious shortcomings: Misspecification of land value equation, inability to measure social and environmental effects, biased population projections and lack of consideration for alternative land uses. A regression model of the effect of flood risk on land values developed with St. Louis area data seems to deal with some of these problems. Research is necessary to develop techniques and models for determining land values. (Salzman-North Carolina)
W76-01595

WASHINGTON'S WATERFRONT LESSON,
North Carolina Univ. at Chapel Hill. Dept. of Fine Arts.
S. J. Makler.
Water Spectrum, Vol 6, No 4, p 21-28, Winter, 1974-75. 11 fig, 6 ref.

Descriptors: *City planning, *Area redevelopment, *Political aspects, *Social aspects, *Psychological aspects, *District of Columbia, Economic justification.
Identifiers: *Waterfront Renewal Project, Washington channel, National Capital Planning Commission, Washington D.C.

This article examines the urban waterfront renewal project in Washington, D.C., pointing out the need to remove blight with caution before resorting to razing and rebuilding. The opposing banks of the Washington channel reflect two diverse land uses: a wooded peninsula on the east and a modern urban complex complete with restaurants, motels, shops and upper-income residences on the opposite side. Authorized by Congress and the National Planning Commission, developers and a non-profit corporation of prominent local citizens planned to revitalize the west bank which, although not deteriorating had a backwater look which was not good enough to be a showcase for the new Southwest. Political and financial interests prevailed with little consideration to neighborhood merchants and residents. The process of renovating the waterfront began with high ideals and grandiose designs coupled with an unclear concept of what should be done. The project evolved in an atmosphere of confusion and compromise between developers and local residents which restricted alternatives. The renewal seems nothing more than a face-lift at a considerable cost which includes expensive flood control and fewer expected revenues from low-density development. The area is more accessible to the public and tourists, and more organized and new in appearance, yet the color, charm and character of the old waterfront are lost. (Salzman-North Carolina)
W76-01596

TOWARDS SYSTEM MODELS FOR WATER RESOURCE MANAGEMENT--A COMMENT,
Department of the Environment, London (England). Systems Analysis Research Unit.
For primary bibliographic entry see Field 6A.
W76-01603

SCHEDULING MAJOR CAPITAL EXPENDITURES TO MINIMIZE COSTS,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 6C.
W76-01604

HENRY GEORGE, PROPERTY RIGHTS AND ENVIRONMENTAL QUALITY: CLASSICAL ANSWERS TO 'NEW' PROBLEMS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 5G.
W76-01614

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01616

FUTURE WATER POLICIES,
Soil Conservation Service, Washington, D.C. River Basins.
For primary bibliographic entry see Field 6E.
W76-01617

THE CONCEPT OF WATER RESOURCES DEVELOPMENT,
Central Water and Power Commission, New Delhi (India).
J. P. Naegamvala.
Indian Journal of Power and River Valley Development, p 6-12, January 1973. 1 tab, 6 ref.

Descriptors: *Water resources development, *Asia, Optimal development plans, Water supply, River basin development, Water storage, Interbasin transfers, Water demand.
Identifiers: *India.

To illustrate the present stage of India's water resources development and to visualize future possibilities, five parameters--the percentage of gross water resources developed, per capita culturable land available, percentage of cultivatable area irrigated, irrigation intensity and per capita water made available are given for each river basin. Based on per capita water made available, irrigation intensity, and percentage of agricultural area irrigated, the Indus basin is the most developed. But in terms of optimum water use, this region has great potential of improving the irrigation efficiency not only of water use and productivity but also to enable diversion to adjoining dry areas in Rajasthan without detrimental effects. The Brahmaputra basin is the most underdeveloped in the country but flood protection overrides other developmental aspects. The Brahamaputra basin waters, when controlled for generation of power and mass trans-basin diversion, will control the destiny of India beyond 2000 A.D. Basin-wide studies of population growth show the urgent need to achieve better water distribution through inter-basin transfers, conjunctive use of surface and groundwaters, etc., with priorities in individual regions. Simultaneously, the need for water conservation by evaporation suppression, better management, and improving supply efficiency for demand-based performance is also indicated. (Auen-Wisconsin)
W76-01618

A RATIONALE FOR A CORPORATE AIR POLLUTION ABATEMENT POLICY,
California Univ., Riverside.
For primary bibliographic entry see Field 5G.
W76-01619

ENERGY--ENVIRONMENT.
Ballinger Publishing Co., Cambridge, Mass.
1975 Current Publications. 16 p.

Descriptors: *Energy, *Environment, *Publications, Law of the Sea, Taxes, Electric power, Pricing, Fuels, Financing, Land reclamation, Transportation, Air pollution, Highway deicing, Water pollution, Oil spills, Regulation.

A complete listing of books published by this company for the Energy Policy Project of the Ford Foundation, together with summaries of their contents is presented. The titles include: A Time to Choose: America's Energy Future; Perspective on Power: A Study of the Regulation and Pricing of Electric Power; Oil Spills and the Marine Environment; Energy, Taxes, and Subsidies; Studies in Energy Tax Policy; Studies in Electric Utility Regulation; Competition in the U.S. Energy Industry; Energy Prices 1960-73; Energy Policy-Industry Perspectives; Potential Fuel Effectiveness in Industry; Financing the Energy Industry; U.S. Energy Research and Development Policy; Energy and Agriculture in the Third World; Energy Consumption in Manufacturing; Rehabilitation Potential of Western Coal Lands; The American Energy Consumer; New Energy Technologies for Buildings: Institutional Problems and Solutions; The Energy Conservation Papers; Nuclear Theft; Energy and U.S. Foreign Policy; Hazards of Maritime Transit; and Global Marine Attributes. Sixteen other titles deal with legal problems of the ocean and environmental and urban economics. (Auen-Wisconsin)
W76-01620

THE ECONOMICS OF THE WEST COAST OIL SPILL CLEAN-UP INDUSTRY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W76-01624

SOME NEW APPROACHES TO SOLVING URGENT PROBLEMS IN THE THEORY AND PRACTICE OF HYGIENIC STANDARDS FOR INJURIOUS SUBSTANCES ,
For primary bibliographic entry see Field 5G.
W76-01659

INSTITUTIONAL BEHAVIOR CONCERNING RIVER BASIN MANAGEMENT LEGISLATION,
Doane Coll. Crete, Nebr.
For primary bibliographic entry see Field 6E.
W76-01682

SALT RIVER PROJECT ANNUAL REPORT, 1974.
Salt River Project, Phoenix, Ariz.
1974, 26 p, 14 fig, 13 tab.

Descriptors: *Water resources, *Electric power production, *Water utilization, *Water management(Applied), *Water resources development, Hydroelectric plants, Power marketing, Electric power costs, Electric power demand, Hydrology, Planning, Water supply, Water allocation(Policy), Water demand, Water requirements, Water distribution(Applied), Arizona, Water delivery, Surface waters.
Identifiers: *Salt River Project, Salt River(Ariz), Verde River(Ariz).

The Salt River Project is comprised of the Salt River Project Agricultrual Improvement and Power District, which provides electric service to residential, commercial, industrial and agricultural power users in a 2,900 sq mile area in parts of Maricopa, Gila, and Pinal counties in Arizona, and the Salt River Valley Water Users' Association, which administers water rights of the Project's 250,000-acre area and operates and maintains the irrigation transmission and distribution system which provides water for agriculture, municipal and industrial uses. For the year 1974, total water demand remained relatively constant, but city demand for water increased from 152,626 acre-ft in 1973 to 160,342 acre-ft in 1974 and the number of electric customers increased from 225,921 to 239,431 from 1973-1974. For 1974, operating revenues totaled $169,585,165 and net revenues reached $8.8 million. Total water use decreased from 895,886 acre-ft in 1973 to 710,723 acre-ft in 1974. (Robinett-Arizona)
W76-01704

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ., Tucson. Div of Economic and Business Research.
H. J. Frank.
Arizona State Fuel and Energy Office, February 1975, 108 p, 10 fig, 41 tab, 24 ref, 5 append.

Descriptors: *Electric power production, *Hydroelectric plants, *Planning, *Arizona, *Electric powerplants, Water resources, Water utilization, Water resource development, Electric power demand, Surface waters, Electric power, Thermal powerplants, Hydroelectric power, Pumped storage, Water utilization.
Identifiers: Energy resources.

The contribution which Arizona's energy resources currently make toward meeting the energy requirements of the state is limited to hydroelectric power and coal. Known deposits of crude oil, natural gas, and uranium are scattered and small, and information on these sources, as well as coal, is inadequate. Energy demand projections indicate that consumption in 1985 could be as much as two and one half time the 1973 level if the historical growth trend continues. There are 12 existing hydroelectric generating sites in Arizona which contributed 11 percent of the state's energy in 1973. These 12 dams have a total of 51 generating units, with a total generating capacity of 3010 megawatts of which about 875 megawatts are available to Arizona (this represents 1.5 percent of the total installed hydroelectric capacity in the United States). There are 18 potential sites for new hydroelectric facilities in the state. No estimates are available of the number of units or the total capacity at 10 of the sites, but the remaining 8 sites could be suitable for a total of approximately 40 generating units with a total capacity of over 17,000 megawatts, or five times the capacity of current units. (Robinett-Arizona)
W76-01709

ENERGY DEVELOPMENT IN THE ROCKY MOUNTAIN REGION: GOALS AND CONCERNS.
Federation of Rocky Mountain States, Inc. Denver, Colo.
July, 1975. 134 p, 7 fig, 20 tab, 36 ref.

Descriptors: *Rocky Mountain Region, *Water utilization, *Electric power production, *Environmental effects, *Planning, Arid lands, Electric powerplants, Hydroelectric plants, Water resources, Social aspects, Water requirements, Economics, Legal aspects, Land resources, Water conservation, Administration, Water law.
Identifiers: *Energy development, Regional energy statements.

This report is composed of 3 parts: the first contains 3 regional energy statements; the second is a summary of data currently in use by state, federal and private business officials and attempts to define the region's energy sources and how the development will affect the states in the Rocky Mountain West with respect to water resources, and environmental and social aspects; the third part consists of a group of background documents on energy development issues, and includes papers on economic effects, social problems, balancing resource development with environental protection, state responsibilities, the federal government and industry, legal questions and alternatives, and a review of federal energy research and development policy. Most noncontroversial hydroelectric sites have already been developed in the West, and those that are underdeveloped are of great environmental value. Limited water resources call for greater care in the location of plants, the selection of extraction, production, and conversion processes, and the choice of product transport and watste treatment systems than would be required in less arid regions. (Robinett-Arizona)
W76-01710

SUMMARY OF 1975 ROCKY MOUNTAIN LAND USE AND NATURAL RESOURCE BILLS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
For primary bibliographic entry see Field 6E.
W76-01711

THE ROCKY MOUNTAIN REGION: A UNITY OF INTERESTS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
October, 1975. 128 p, 80 tab, 42 ref.

Descriptors: *Rocky Mountain Region, *Natural resources, *Water resources, *Planning, *Agriculture, Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming, Water conservation, Water utilization, Land resources, Recreation, Water requirements, Arid lands, Social aspects, Economics, Transportation, Forestry, Land use, Urbanization.

This publication represents a source of information for the Rocky Mountain Region (including Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming), with respect to natural resources, human resources, transportation, market development, telecommunications, housing and community development, agriculture, and the arts and humanities. The natural resources, water needs and projects, and future plans of each state are discussed. Statistics in the following categories are given for each state: agriculture, water, energy and minerals, land use and ownership, forestry, grazing land, outdoor recreation, and socio-economics. Water needs for agriculture and municipal use are increasing while the region remains the driest area in the United States. A large percentage of the water iused is for irrigation, and if new water needs are not met, the agricultural industries will suffer first. (Robinett-Arizona)
W76-01712

STAGE 1 DEVELOPMENT OF THE SHOALHAVEN SCHEME-I.
Snowy Mountains Engineering Corp., Cooma (Australia).
Water Power and Dam Construction, Vol 27, No 8, p 275-282, August, 1975. 4 tab, 9 fig.

Descriptors: *Sewerage, *Water supply, *Electric power, Dams, Construction, *Australia.
Identifiers: Catchments.

The Shoalhaven scheme, divided into three stages, is being developed in order to increase safe sewerage and supply system draft. It is headed by the Sydney Metropolitan Water Sewerage and Drainage Board (the Board) and by the Electricity Commission of New South Wales (the Commission). Facilities for phase 1 of stage 1 are discussed in detail. The Shoalhaven was chosen because it was the only catchment potentially able to meet the Board's requirements up to the year 2010. Stage development was advised in order to cumulatively increase the safe draft of the total system of 340M1/day by 1975, 1250M1/day by 1982, and 2140M1/day by 2000. Stage 1 is functionally divided into two projects: the Kangaroo-Fitzroy project which includes all works from the Tallowa dam north to the Fitzroy Falls reservoir and which is involved in pumping capacities; and, the Burrawang-Wingecarribee project which includes all

works north of Fitzroy Falls reservoir that transfer pumped Shoalhaven water into the Nepean and Wollondilly catchments and which will include the building of a dam. Operational and dimensional data for the various dams are shown in the tables. The main features of the scheme comprise the Tallowa dam, the Bendeela power station, the Bendeela pipeline, the Bendeela pondage, the Kangaroo Valley facilities, and the Fitzroy canal and Fitzroy Falls dam. (Waltner-FIRL)
W76-01732

DENVER SEEKS TOMORROW'S WATER TODAY,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 4A.
W76-01779

PENNSYLVANIA USES CREATIVE APPROACH TO WATER QUALITY MANAGEMENT PLANNING,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Environmental Protection and Regulation.
For primary bibliographic entry see Field 5G.
W76-01796

REGIONAL INSTREAM FLOW NEEDS IN THE PACIFIC NORTHWEST: AN ANALYSIS OF INSTITUTIONAL, LEGAL, AND TECHNOLOGICAL ASPECTS OF ALLOCATION PROCESSES FOR LIMITED STREAMFLOW,
Washington State Water Research Center, Pullman.
H. R. Doerksen, J. F. Orsborn, F. D. Deane, and B. L. Lamb.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 424, $7.50 in paper copy, $2.25 in microfiche. Report No 20, April 1975. 177 p, 3 fig, 25 tab, 500 ref, 4 append. OWRT C-5344(4241)(1).

Descriptors: *Regional analysis, *Pacific Northwest U.S., Institutions, Legal aspects, Technology, *Streamflow, *Water allocation(Policy), Low flow, Competing uses, Political aspects, Methodology, Flow.
Identifiers: *Instream flow needs, Minimum flows, Information transfer.

Investigation was conducted into the legal, political, and technological aspects of the process of determining stream flow requirements for various uses, and establishing and preserving those flows. Although the term 'methodology' is usually assumed to imply 'technical methodology,' many procedural steps, from the time of recognition of need for the preservation of flow in a stream to the time of flow establishment, are really parts of the 'methodology.' Instream flow methodology should be considered as a water resource allocation process which includes: technological determinations of needs for the instream and out-of-stream uses; flow recommendations and decisions in the legal-politcal arena; establishment of flow levels under the law; and, maintenance and monitoring of the reserved flow or flows. Contacts were initially established through several workshops conducted under an earlier project and through questionnaires on the legal, political, and technical aspects of the problem. The questionnaires were sent to various state and federal agencies in Utah, Oregon, Washington, Idaho, Montana, Wyoming, and Colorado. Personal interviews with many agency personnel were used to explore details of the agency programs and their methodologies.
W76-01797

BENEFITS AND COST OF DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
K. M. Naber, and W. L. Miller.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 412, $5.00 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center Technical Report No 65, August 1975. 88 p, 14 fig, 7 tab, 48 ref, append. Partial Completion Report. OWRT C-3277(3713)(8).

Descriptors: *Urban drainage, *City planning, *Community development, *Cost-benefit analysis, *Economic rent, Drainage systems, Urban runoff, Urbanization, Economics, Decision making, Cost comparisons, Cost-benefit ratio, Costs, Benefits.

A method is proposed for estimating the benefits and costs of providing adequate urban storm drainage facilities. This kind of information is essential for planners and decision makers for urban development. The concept of economic rent was used in the development of the model. For example, economic rent was condidered the increase in selling price of a residence due to the provision of adequate storm drainage facilities. The cost to provide the drainage system is equal to the expected loss in economic rent. Also involved was estimating and comparing the benefits and costs of providing storm drainage in an area prior to urbanization with the benefits and costs of providing storm drainage in an area where urbanization was complete. Results in the case studies used indicated that cost of installing adequate storm drainage facilities in an residential area was greater than the benefits derived. This conclusion did not take into account the value of damages accrued by other members of society as inconvenience of detouring flooded streets, street damage, etc. A comparison of the benefits and costs of providing storm drainage prior to urbanization resulted in a favorable ratio. Although the case study limits the applicability of the results, a similar approach to evaluate the benefits and costs of a storm drainage system can be used for other areas. (See also W76-01799) (Wiersma-Purdue)
W76-01798

STOCHASTIC MODELS FOR GROUND WATER LEVELS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W76-01799

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART I, EFFECT OF THE 'REVIEW AND COMMENT PROCESS' ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE,
Stanford Univ., Calif. Dept. of Civil Engineering.
W. W. Hill, and L. Ortolano.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 433, $7.75 in paper copy, $2.25 in microfiche. EEP-Report No 52, September, 1975. 208 p, 5 fig, 15 tab, 55 ref, 2 append. Partial Completion Report. OWRT-C-4080(9017)(1).

Descriptors: *Environmental effects, *Project planning, *Administrative decisions, *Attitudes, *Administrative agencies, *Institutions, Social aspects, Water resources development, Small watersheds, Soil conservation, United States, Federal government, Institutional constraints.
Identifiers: *National Environmental Policy Act of 1969, *Environmental impact statement, *Soil Conservation Service, *Army Corps of Engineers, *Interagency coordination, Public involvement, Agency regulations, Council on Environmental Quality.

The review and comment (R and C) process refers to the circulation of environmental impact statements (EIS), and earlier informal versions thereof, to agencies and publics for review and comment pursuant to the requirements of section 102 (2) (C) of the National Environmental Policy Act of 1969 (NEPA). This report examines the effect that this process has had on Corps of Engineers pre authorization studies and Soil Conservation Service small watershed planning. The ways in which the R and C process might be used in attaining NEPA's policy objectives form the framework for the analysis which systematically examines: how the R and C requirements have been integrated into the Corps and SCS planning processes, the extent to which coordination has increased, the usefulness of the information obtained and the extent to which this information has influenced agency decision making. Data obtained from 242 questionnaires completed by planners in every Corps District and SCS State Office show that coordination with other agencies and publics has increased, though the respondents' perceptions of the utility of the information obtained as a result of this is mixed. One very significant finding is that the R and C process has forced planners to give more serious consideration to suggestions made by other agencies. However, the effect on final decisions appears to be limited because the R and C process is not begun until quite late in the planning process. Obstacles to an effective R and C process are discussed. (See also W76-01801)
W76-01800

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA,
Stanford Univ., Calif. Dept. of Civil Engineering.
J. Randolph, and L. Ortolano.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 434, $8.00 in paper copy, $2.25 in microfiche. EEP-Report No 53, September, 1975. 228 p, 11 fig, 8 tab, append. Partial Completion Report. OWRR-C-4080(9017)(2).

Descriptors: *Environmental effects, *Project planning, *Multiple purpose projects, *Administrative decisions, *California, Water management(Applied), Attitudes, Social aspects, Feasibility studies, Institutions, Water resources development, Flood control, Water supply, Federal government.
Identifiers: *National Environmental Policy Act of 1969, *Environmental Impact Statements, *Army Corps of Engineers, *Interagency coordination, Statislaus River(California), Carmel River(California).

Two case studies were employed to examine the '102 process'; i.e., the procedures followed by federal agencies in the implementation of section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA). The effectiveness of the 102 process in integrating environmental factors in planning was analyzed. The approach relied on written documentation and personal interviews to provide an historical analysis of factors relevant to decision making in the context of the case studies. The Sacramento District's planning of the New Melones project on the Stanislaus River illustrates NEPA's influence in a situation where much of the planning occurred prior to NEPA's passage. NEPA's influence was limited to bringing about project modification features. The San Francisco District's planning in the Carmel River Basin was conducted after the passage of NEPA. In this case, the 102 process had little influence on the types of alternatives examined and on the determination of project size. The process did, however, have some influence on the introduction of project mitigation features. For the 102 process to be effective in implementing NEPA's policy goals, much more attention must be given to the implementation of sections 102(2)(A) and 102(2)(B) of NEPA. (See also W76-01800)
W76-01801

ECONOMICS OF WATER SUPPLY PLANNING AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. C. Frey, H. B. Gamble, and O. H. Sauerlender.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 560, $6.75 in paper copy, $2.25 in microfiche. Research Publication No 90, June 1975. 145 p, 56 tab, 8 fig, 5 append, 50 ref. OWRT C-3119(3688)(1).

Descriptors: *Droughts, *Cities, *Northeast U.S., *Water demand, Cost analysis, Elasticity of demand, Return to scale, Planning, Water management(Applied), Water supply, Water districts, Pricing.
Identifiers: *Water utilities, *Special water districts, *Shortage, *Water pricing.

A sampling of medium-sized cities in the Northeastern United States provided data and information useful in understanding the organization and management of municipal water utilities. The following objectives were pursued: (1) identification and description of political, demographic, systemic and economic characteristics of water utility systems that account for differential response patterns to shortage situations; (2) development of an index for evaluating the capacity of water supply systems to accommodate potential demands; (3) development of a cost function to determine whether economies of scale can be exploited in developing systems capable to avoiding drought shortages, and (4) estimation of the elasticity of residential demand for water to determine the feasibility of alleviating the consequences of drought by flexible pricing. A regression analysis was undertaken to ascertain the impact of selected variables on the supply-use ratios of the sampled utilities. Ownership patterns, the proportion of water used for residential purposes, variability in consumption requirements, and population density were the most significant factors. The long run elasticity of residential demand for water was approximately -0.20. In effect, a ten percent increase in price would probably reduce consumption only two percent. (Sink-Penn State)
W76-01802

CAPACITY OF WATER-BASED RECREATION SYSTEMS, PART III: METHODOLOGY AND FINDINGS,
North Carolina State Univ., Raleigh. Dept. of Recreation Resources Administration.
H. K. Cordell, G. A. Hammon, J. Graham, W. L. Hafley, and M. R. Warren.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 557, $5.50 in paper copy, $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No 90, September 1975. 109 p, 3 tab, 27 fig, 4 exhibits. OWRT B-013-NC(5). 14-01-0001-1936.

Descriptors: *Recreation demand, *Recreation facilities, *Boating, *Water skiing, *Swimming, Water sports, Water zoning, Model studies, Aerial photography, *North Carolina, Planning, Methodology.
Identifiers: Recreation capacity, Recreation planning, *Lake Burlington(NC).

This is the third of a series of publications reporting on research to develop methods, models, and guidelines for planning and managing water-based recreation systems. The previous reports are: Capacity of Water-Based Recreation Systems: Part I, The State of the Art - Gordon A. Hammon, Harold K. Cordell, et al, (April 1974) and Capacity of Water-Based Recreation Systems: Part II, A Systems Approach to Capacity Analysis - Gordon A. Hammon, Harold K. Cordell, et al, (July 1974). (See W74-07719 and W74-12364). In this report, methods conceptualized and tested for collecting and processing data describing recreational boating behavior are presented. The test site was Lake Burlington in the Piedmont of North Carolina. Means for data collection included questionnaires, interviewing, shoreline-based observation, and aerial photography. Based on an analysis of the interview and on-site observation data a major finding is that capacity, measured as number of boats which should use a lake system at the same time, probably should not be fixed by the managing authority. Boaters at the study site appeared to have acclimatized themselves to the frequently heavy use conditions which sometimes exceeded 1 boat per 6 acres of water surface. Thus managers and planners' continual for the magic number called capacity, which if found and used is believed to be the solution to many management problems, appears to be an unnecessary pursuit. (Stewart-North Carolina State)
W76-01804

AN INNOVATIVE ORGANIZATIONAL ARRANGEMENT FOR COMPREHENSIVE WATER SERVICES: THE THAMES WATER AUTHORITY AS A MODEL FOR COMPLEX AREAS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W76-01815

DETERMINATION OF THE NUMBER OF COMMERCIAL AND NONCOMMERCIAL RECREATIONAL BOATS IN THE UNITED STATES, THEIR USE, AND SELECTED CHARACTERISTICS,
K. M. Bromberg.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11186, $5.50 in paper copy, $2.25 in microfiche. Report No NOAA-74051407, December 1973. 116 p, 3 append.

Descriptors: *Marine fish, *Boats, Sport fishing, Estimating, Statistical methods, Recreation, Saline water fish, Marine fisheries, Surveys.
Identifiers: *Salt water fishing.

To measure the impact of both commercial and noncommercial recreational boats in salt water fishery resources (the estuarine and ocean environment), the National Marine Fisheries Service must have current, accurate information. The findings of a survey research effort to determine the number of commercial vs. noncommercial recreation boats that fish in salt water, and the species sought by these boats is reported. Twenty-eight sampling units of noncommercial salt water sport fishing were created throghout the U.S. according to geographic proximity to salt water. Random telephone calls, distributed in the 28 sampling units according to the number of state licensed boats, were made with 941 of 9939 household respondents reporting that their household owned one or more boats. Estimates of (1) the number of private recreational salt water fishing boats, (2) the number of trips and days used per 12 months, and (3) species of fish sought are made. Commercial salt water fishing boats were sampled from listings of commercial sport fishing vessels with 159 of 163 operators of commercial recreational vessels responding. The number of boats, trips and days used in 12 months, fish species sought and annual gross revenue are estimated for all commercial salt water sport fishing vessels from these responses. (Becker-Wisconsin)
W76-01817

PLANNING WATER RESSOURCES DEVELOPMENT.
Economic Commission for Asia and the Far East (UN), New York.
Available from U.N. Sales Office, New York or Geneva, for $2.50. Report of the Working Group of Experts on Water Resources Planning, Bangkok, August 29-September 9, 1968, Thailand. United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, (August 1969). 135 p, 4 fig, 3 tab.

Descriptors: *Water resources development, *Asia, *Comprehensive planning, *International commisions, *United Nations, Decision making, Prices, Standards, Financing, Discount rates, Irrigation, Project life, Project purposes, Intangible benefits, Flood control, Multiple-purpose projects, Inland waterways, Income distribution, Economic efficiency, Water supply, Hydroelectric power, Government finance, Psychological aspects, Agriculture, Training, Financial feasibility, Economic impact, Evaluation, Interest rates, Project benefits, Costs, Social aspects, Project planning.
Identifiers: *Far East, *Project evaluation.

Prepared background papers and ensuing discussions are presented for four sub-headings of subject matter from the joint meeting of the Economic Commission for Asia and the Far East (ECAFE) and the United Nations Office of Technical Cooperation. This Working Group of Experts, which met at Bangkok, Thailand in 1968, included representatives from 19 member countries, including the USSR and the U.S. Under the topic of procedures and standards for the economic and financial analysis of water resources planning, the definitions and applications were presented for the concepts of opportunity cost, shadow price, interest rate, indirect tax, period of analysis and project costs. Other background papers in this area discussed the topics of irrigation development costs at the farm level and the criteria used in economic evaluation. Papers on social and non-economic, and social and economic considerations in water resources projects raised topical questions ranging from planning and administration to mobilizing public support. The coordination of various agencies covering water resources development and related fields, and other considerations important to the long range future of water resources development are discussed. The general conclusions and recommendations from the final sessions of the Working Group are included. (See also W76-01819 thru W76-01826) (Becker-Wisconsin)
W76-01818

MEASUREMENT STANDARDS FOR PROJECT EVALUATION--PRICES AND INTEREST BY THE ECAFE SECRETARIAT.
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, p 23-34, 4 tab.

Descriptors: *Project planning, *Evaluation, *Methodology, Cost-benefit analysis, Interest rates, Discount rates, Prices, Inflation(Economic), Risks, Asia.
Identifiers: *Market prices, *Shadow price.

The procedure to be followed in assigning prices and interest rates to physical resources involved in a project (so that the benefits and costs of a project may be evaluated) is outlined. It is recommended that market prices be used generally, and the correct shadow prices should be used alternatively in those cases where market prices would cause divergencies of crucial importance in deciding a project's worth. Ambiguities arising from indirect taxes and foreign trade tariffs are to be resolved by using prices net of taxes in the former case and international prices in the latter. Some average yield on longterm government bonds is recommended as the correct interst rate, with noted exceptions. Discounting methods are mentioned. The effects of price changes independent of and resulting from the project on the valuation of the project are considered. Inflation generally must be ignored, especially if changes in relative prices do not occur. Cost-benefit analysis, where both public and private participation are anticipated, should be carried out under two assumptions: (1) that private participation is forthcoming; (2) that private participation is unavailable and that part of the project involving such participation will have to be shelved. The role of risks and uncertainties is analyzed. (See also W76-01818) (Becker-Wisconsin)

W76-01819

PROJECT COSTS.
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series, No 37, p 35-41. 1 fig, 1 tab.

Descriptors: *Costs, *Evaluation, *Project planning, *Estimated costs, Annual costs, Estimating, Cost allocation, Capital costs, Right-of-way, Construction costs, Replacement costs, Operating costs, Maintenance costs, Asia.
Identifiers: Resettlement costs.

Project costs are defined as the sum of all expenditures required to realize project objectives. Aspects of costs estimation from both pre- and post-construction bases are discussed. Actual project costs are determined only after a project has been completed and the accounting books closed. Estimates of costs for planning purposes are usually divided into three classes: (1) reconnaissance estimate--prepared using already available data in order to get an initial judgement of the suitability of a project for further feasibility studies; (2) feasibility estimate--follows a positive judgement on the reconnaissance estimate and uses more detailed and specific data in order to form the basis for authorization of a project; (3) definite plan or pre-construction estimate--based on data obtained for final designs and specifications prior to letting out construction contracts. Various components of capital costs are discussed in more detail: costs of land and rights-of-way, population resettlement, construction costs, farm-development costs and annual costs. Specifically, construction costs include field costs, engineering and design costs, administrative costs, investigational costs, and interest. An annual cost figure is usually used as a common basis for comparing project benefits and costs which occur at different times during the life of the project. (See also W76-01818) (Becker-Wisconsin)
W76-01820

IRRIGATION DEVELOPMENT COSTS AT THE FARM LEVEL.
Food and Agriculture Organization of the United Nations, Rome (Italy).
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, p 43-57. 7 tab.

Descriptors: *Project planning, *Costs, *Irrigation programs, *Water distribution(Applied), Asia, Farm units, Irrigation efficience, Government supports.

Experience has demonstrated that the costs of irrigation projects at the farm level should be considered in project costs in order to avoid serious delays of project benefits. Successful farm-development measures in conjunction with irrigation projects depend on: (1) careful water distribution to each farm plot; (2) land reform and consolidation of small plots; (3) active well-supported research and extension programs; (4) credit provisions for fertilizers, improved seeds and pesticides; and (5) well informed and organized farmer associations. In order to evaluate the success of farm output stimulation programs all costs need to be identified and evaluated. These costs can be divided into (1) service area development cost--the costs of making water available at the boundary of land area; (2) farm development costs--including the major items of land leveling and smoothing, land preparation, and drainage; (3) government support costs--those costs for services and assistance that the government needs to furnish to the area in order to improve farm production and the farmers' standard of living and to secure return from investment. Farmers' attitudes and cooperation in operation and maintenance of irrigation systems is considered as a factor in irrigation development costs. (See also W76-01818) (Becker-Wisconsin)
W76-01821

IDENTIFICATION AND MEASUREMENTS OF ECONOMIC PROJECT BENEFITS.
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, p 58-70.

Descriptors: *Evaluation, *Project benefits, *Economic impact, *Water resources development, Irrigation, Flood control, Hydroelectric power, Navigation, Water supply, Watershed management, Measurement, Asia, Direct benefits, Indirect benefits, Fringe benefits, Alternative planning, Recreation.

The economic benefits of a project are represented by the increase in the value of the output goods and services stemming from the project and are measured by their quantities and their market prices. Definitions of primary, secondary, and national project benefits and associated costs are provided. The benefits of water resources projects are identified on the basis of the need for development; principles and assumptions involved in the measurement of benefits are discussed; procedures of measurement of benefits are described; and limitations of the application of present valuation techniques are pointed out. The reliability of benefit measurement depends on conditions which vary from country to country: available knowledge about the project's future; projection of future conditions; and the measurement techniques applicable and selected. Seven project-types are discussed in terms of evaluation techniques, primary and secondary benefits, and demand for the project-type. They are irrigation, flood control, hydro-power, navigation, public water supply, recreation, and watershed management. Limitation of the present knowledge concerning benefit measurement includes incomplete information on input and output; biased projection techniques; nonuniformity of the standard of value among beneficiaries, and the necessity of considering other measures in planning decisions. (See also W76-01818) (Becker-Wisconsin)
W76-01822

CRITERIA OF ECONOMIC EVALUATION IN WATER RESOURCES DEVELOPMENT.
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, p 71-80.

Descriptors: *Project planning, *Water resources development, *Economic impact, *Evaluation, Economic efficiency, Income distribution, Project benefits, Costs, Welfare(Economics), Gross National Product, Asia, Cost-benefit ratio.

Goods and services from multipurpose water resources projects are diverse in nature, meeting various needs and desires of the people which may also be met by alternative means. In order to make a comprehensive assessment of the effectiveness and efficiency of water resources projects in attaining the ultimate societal goals, various evaluations from different viewpoints have to be made. Goods and services produced by water resources projects can be classified into three categories: (1) incidental benefits--for which no substantial costs are incurred in their production; (2) goods and services produced without conflict with other possible uses; (3) goods and services produced in conflict with other uses. The objectives of economic evaluation of water resources projects include: the determination of the functions to be included in the project and the optimum scale of development for each function, the examination of the effectiveness and efficiency of each alternative plan of a project in meeting economic, social, and political goals, and the provision of economic data to establish cost allocation. Economic efficiency criteria and redistribution of income criteria are discussed on theoretical and applied bases. Benefit-cost, rate of effectiveness, and minimum cost criteria are examined individually. (See also W76-01818) (Becker-Wisconsin)
W76-01823

FINANCIAL ANALYSIS.
In: United Nations Economic Commissions for Asia and the Far East, Water Resources Series No 37, p 81-99. 17 tab.

Descriptors: *Water resources development, *Financing, *Return(Monetary), Loans, Debt, Interest, Reimbursable costs, Non-reimbursable costs, Cost repayment, Amortization, Asia.
Identifiers: *Financial analysis, Foreign loans.

The development of water resources entails the creation of lasting physical assets, at the same time, because development can seldom be financed out of revenue, it mortgages the future. The financial analysis of a proposed development project serves to demonstrate that the project can be financed in such a way that the costs of development can be repaid out of direct monetary returns accruing to the project during the maturity of the loans raised to finance it. The financial analysis includes only the direct monetary returns or revenues and spans the terms to maturity of the loans. It allocates the total financial cost to various beneficiaries and assesses how much they should pay. Local and foreign indebtedness, government subsidies, reimbursable and nonreimbursable costs, and repayment schedules are discussed in terms of their application to and their considerable impact on the financial analysis. Also discussed are: (1) project costs--entering the financial analysis as either capital costs or operations maintenance and replacement costs; (2) the financing of the foreign-exchange and local-currency components; (3) and repayment capcity. Two comprehensive examples of financial analysis are included. (See also W76-01818) (Becker-Wisconsin)
W76-01824

SOCIAL AND NON-ECONOMIC CONSIDERATIONS IN WATER RESOURCES PLANNING AND DEVELOPMENT.
In: United Nations Economic Commissions for Asia and the Far East, Water Resources Series No 37, p 100-123. 2 fig.

Descriptors: *Project planning, *Water resources development, *Social aspects, *Social participation, Institutions, Social impact, Social needs, Social change, Asia.

The improvement of social welfare is generally accepted as the essential, overriding purpose of planned development; so far, however, national planning and development in Asia have yielded very meager benefits. Levels of nutrition and housing are static or declining, while unemployment and underemployment remain chronic, and the distribution of national income seems to be becoming increasingly uneven and inequitable. This unfavorable and potentially explosive situation can be attributed partially to the sluggish pace of economic growth in Asia and to widespread neglect of social considerations in development planning. Lack of energetic public participation in national development efforts is one cause for the slow rate of development. Main elements in the promotion of dynamic social change are identified. Major program approaches that should be built into water resources development schemes in order to serve the objectives of productivity oriented income redistribution and promotion of massive popular support are discussed in terms of project evaluation, integrated agricultural and industrial development, and social services and allied programs. Also considered is the handling of social and noneconomic problems of water resources development in terms of policy-making and planning, integration of planning and fiscal policies, preparation of planning, administrative, and technical personnel, and research and evaluation. (See also W76-01818) (Becker-Wisconsin)
W76-01825

CO-ORDINATING THE ACTIVITIES OF ALL AGENCIES GOVERNING WATER RESOURCES DEVELOPMENT AND RELATED FIELDS.
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, p 124-135.

Descriptors: *Administration, *Project planning, *Water resources development, Governmental interrelations, Inter-agency cooperation, Asia, Australia.
Identifiers: Taiwan, Indonesia, India, Iran, Japan, Laos, Malaysia, Nepal, Pakistan, Philippines, Singapore.

The countries of Asia and the Far East, with their agrarian populations and developing economies, consider water to be one of their principal resources and place much emphasis on its development and utilization. It is, therefore, important that there should be a well-considered and defined policy for the development of water resources of each region or basin, aiming at the use of water from all sources, for the greatest benefit of the people and compatible with the national plans for overall economic and social development. The preparation of basin plans or the development of other major water resources projects entails the collection, compilation, and analysis of a large mass of data and calls for cooperation and coordination among specialists in many fields. There must be a strong and competent organization to handle the coordination of the many activities. The roles of individuals, and of local, state, and national government and their agencies are explained. Examples of activities characteristically recognized as local, regional, or national responsibilities are given. The coordinating agencies are outlined for some of the ECAFE (Economic Commission for Asia and the Far East) countries: Australia, Ceylon, Taiwan, India, Indonesia, Iran, Japan, Laos, Malaysia, Nepal, Pakistan, Philippines, and Singapore. (See also W76-01818) (Becker-Wisconsin)
W76-01826

PERFORMANCE CONTROLS FOR SENSITIVE LANDS: A PRACTICAL GUIDE FOR LOCAL ADMINISTRATORS,
American Society of Planning Officials, Chicago, Ill.
For primary bibliographic entry see Field 6F.
W76-01871

WATER USE, SEMINAR DAMASCUS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 3F.
W76-01878

TRAINING AND EXTENSION FOR EFFECTIVE USE OF IRRIGATION WATER,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W76-01890

NEAR EAST APPLIED RESEARCH PROGRAMME FOR LAND AND WATER DEVELOPMENT,
Food and Agriculture Organization of the United Nations, Cairo (Egypt). Near East Regional Office.
For primary bibliographic entry see Field 3F.
W76-01891

WATER MANAGEMENT IN ONTARIO--AN ECONOMIC EVALUATION OF PUBLIC POLICY,
British Columbia Univ., Vancouver. Dept. of Economics.
R. S. Campbell, A. S. Pearse, and M. Uzelac.
Osgoode Hall Law Journal, Vol 12, No 3, p 475-526, 1974, 52 p, 165 ref.

Descriptors: *Economic efficiency, *Canada, *Watercourses(Legal aspects), *Water management(Applied), Administration, Water resources, Domestic water, Navigation, Riparian rights, Common law, Permits, Governmental interrelations, Foreign countries, Adoption of practices, Water conservation, Water supply development, Water law, Regulation.
Identifiers: Public policy, Available flow, *Ontario.

This essay examines, from an economic point of view, the efficiency of the complex framework of water law regulating water use in Ontario. There are two primary dimensions of water as a valuable resource. One is its physical quantity, which is useful in both 'withdrawal uses' such as domestic consumption and industrial processes and in 'in place uses' such as power generation and navigation. The scarcity factor, or 'available flow' can be augmented and regulated by various works. The other dimension of water is its capacity to absorb and disperse wastes. The scarcity factor in this dimension is referred to as the 'assimilative capacity' of the watercourse. It can also be augmented. Topics discussed concerning the available flow dimension include: legislative provisions; administration of the permit system; federal involvement; municipal and regional arrangements; and economic implications of flow allocation arrangements. Topics explored concerning the assimilative capacity include: common law doctrines; the discharge approval system; municipal-provincial arrangements; and the economic application of quality control arrangements. (Hoffman-Florida)
W76-01969

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A BARGAINING APPROACH FOR PROGRAMMING LEAST-COST WASTE TREATMENT ALONG A RIVER,
North Carolina State Univ., Raleigh. Dept. of Economics; and North Carolina State Univ., Raleigh. Dept. of Business.
For primary bibliographic entry see Field 5D.
W76-01504

READING USAC PROJECT: SEWER AND WATER ACCOUNTS PROCESSING COMPUTER PROGRAM, RELEASE NUMBER ONE, SOFTWARE,
Reading, Pa. USAC Project.
For primary bibliographic entry see Field 5G.
W76-01527

OPTIMAL PRICING AND INVESTMENT IN COMMUNITY WATER SUPPLY,
Tennessee Univ., Knoxville.
W. Goolsby.
Journal American Water Works Association, Vol 67, No 5, p 220-224, 1975. 6 fig, 20 ref.

Descriptors: *Water works, *Pricing, *Investment, Return to scale, Economies of scale, Costs, Water demand, Elasticity of demand, Model studies.
Identifiers: *Peak load pricing.

As the demand for water grows in the serviced area, the price of water should rise during periods of peak usage; the rise in price should be just large enough to equate the quantity demand with the quantity supplied. Based on the assumption that increases in demand can be correctly anticipated, the original plant will be built larger than required at the time of construction to allow for economies of scale in the production and distribution of water. This will result in that initially the peak price of water may be no more than marginal running cost. However, at some point in time, the sum of charges exceeding marginal running cost will begin to amortize the original fixed investment plus those costs associated with waiting for this payment to be made. Two cycles of concern to water supplies are emphasized--the demand cycle and the envestment cycle. The response of water prices to these cycles should be that rise with increased demand, and that prices fall with increases in excess capacity, whether an increase in excess capacity occurs as the result of an expansion of the existing plant or a slackening of demand. (Auen-Wisconsin).
W76-01600

DALLAS RATE SURVEY.
Dallas Water Utilities Dept., Tex.
Journal American Water Works Association, Vol 67, No 5, p 232-238, 1975. 13 tab.

Descriptors: *Surveys, *Water rates, Water works, Alabama, Arizona, California, Colorado, District of Columbia, Florida, Georgia, Hawaii, Indiana, Illinois, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Missouri, Minnesota, Nebraska, New Jersey, New York, New Mexico, North Carolina, Oklahoma, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Virginia, Washington, Wisconsin.
Identifiers: Dallas(Tex).

A 1974 water rate survey conducted by the Dallas Water Utilities, Texas, includes data for 62 utilities from cities in 28 states and the District of Columbia. All the utilities service areas where the urban population are in excess of 125,000. In addition many service, either directly or indirectly, areas beyond that of the inner city. One set of tables is concerned with the billing procedure and the second set gives data about charges. The billing procedures include information on: Water supply (ground, surface, or combination); system municipally owned; penalty or discount, and amount, plus time period; delinquent meters before turn-off or other action; penalty charge for insufficient fund checks; turn-on charges, by weekday, evening, weekend, and holiday; service call charges; transfer fee; deposit required for commercial and residential installations; interest paid on deposit accounts; rate increase next year; percent of increase; and date of last increase. The metering data include monthly or semimonthly billing; minimum charge; quantity of water for minimum charge; meter size for new charge; revenue source; volume measurement (cu ft or gal); monthly meter residential rate by volume increments; and percentage added for outside city limits for retail service to residential customers. (Auen-Wisconsin)
W76-01601

DREDGING COSTS: THEIR ESTIMATION AND IMPLICATIONS TO THE MANAGEMENT OF DREDGING OPERATIONS,
University of Wales Inst. of Science and Tech., Cardiff. Dept. of Maritime Science.
R. J. Webb.
Dock and Harbour Authority, (U.K.), Vol 54, No 64, p 406-409, 1974. 2 fig, 6 tab.

Descriptors: *Dredging, *Costs, *Estimating, *Harbors, Indirect costs, Direct costs, Cost allocation, Depreciation, Economic life, Interest, Operating costs.
Identifiers: Costing systems, NIVAG cost model, Inflation.

To measure the cost-efficiency of a harbor dredging operation and to provide a basis for predicting the effects of operation changes on cost-efficiency (emphasizing the level of direct costs and the distribution of costs of the various heads) three costing systems are compared: (1) The traditional financial account; (2) the 'NIVAG' cost model which is used by many Dutch contractors for building up their tender prices. It is designed to

predict rather than record costs, and only the operating costs are left for calculation from earlier records; and (3) opportunity costing, achieved by comparing the port's options at the close of the year to those at the year's opening. It is shown that the financial accounting seriously underestimates the costs of operating a dredger and should not be used. Also that the operation is capital intensive. If the NIVAG maintenance costs are reduced to the port authority level, the capital distribution to the NIVAG total is 65%. Research should therefore be directed towards the minimization of capital involvement rather than overtime limitation or fuel economy. To increase output two basic choices are available: (a) purchase and employ larger or more craft; (b) work existing craft more intensively and/or reduce down time. (Auen-Wisconsin)
W76-01602

SCHEDULING MAJOR CAPITAL EXPENDITURES TO MINIMIZE COSTS,
Hazen and Sawyer, New York.
W. B. Sinnott.
Journal American Water Works Association, Vol 67, No 5, p 271-174, 1975. 1 fig, 3 tab.

Descriptors: *Water works, *Investment, *Annual costs, Interest rates, Construction costs, Financing.

The effect on annual costs of scheduling water works improvements is discussed. The practice of making investment decisions based only on escalating construction costs fails to recognize the changes in the value of the dollar. One method of dollar evaluation is to use the difference between the rates of change of construction costs and those for the cost of living, herein designated as 'relative escalation' of construction costs. Another factor in scheduling capital improvements is interest rates. Long-term downward trends and shortterm variations offer excellent opportunities to schedule capital improvements to reduce overall costs. Among the examples cited are that a decrease in interest rates of 0.25%/year will offset the effect of a 3%/year relative escalation of construction costs, and a decrease in interest rates of 0.42%/year will offset the effect of 5.0%/year relative escalation in construction costs. Also variables in investment decisions are the effects of depreciation on capital improvements, broader financing options with time, and avoidance of additional operating costs by delayed construction. With interest rates at or near the top, forecasting general long-term trends would seem to be less risky than during a period of average rates. (Auen-Wisconsin)
W76-01604

WATER RATE REFORMULATION,
Wilmington Water Dept., Del. Water Commission.
A. J. Maitland.
Journal American Water Works Association, Vol 67, No 5, p 262-263, 1975. 3 tab.

Descriptors: *Public utilities, *Water rates, *Pricing, *Equitable apportionment, *Delaware, Water utilization, Cities, Suburban areas, Industrial water.
Identifiers: Wilmington(Del).

The Wilmington, Delaware, water department designed a new water rate structure to equalize water costs between the city and suburban users, and between small-volume users and large-volume customers. Alternative costs and price sets were developed based on management priorities, engineering, and economics. The typical city and county fixed and variable costs were built into each cost set. Additional variable costs were built into the cost sets to reflect different management decisions, such as city overhead, additional management staff, pension accruals, and a 3-6% return on investment. Engineering considerations were used to distribute the fixed costs to arrive at a base, fixed charge per customer based on the capacity factors of the variously sized meters. The new rate structure, which went into effect July 1, 1970, has been adequate to meet the costs of the water system through 1975. The side-effects generated by this rate revision were that some customers reduced their meter size, water consumption has dropped, new rate structure emphasizes accurate metering, which in turn necessitated acceleration of a meter-replacement program; meter readings are done oftener to divide the bill into smaller segments; and the 12-year interval in rate revisions resulted in a sizeable rate increase, causing customer dissatisfaction. (Auen-Wisconsin)
W76-01605

MUNICIPAL IMPOSTS AND LEVIES FOR ONTARIO WATER UTILITIES,
Beaufort Engineering and Development Ltd., Burlington (Ontario).
H. E. Sears.
Journal of American Water Works Association, Vol 67, No 5, p 258-261, 1975. 2 fig, 4 tab.

Descriptors: *Public utilities, *Water users, *Distribution systems, *Assessments, Local governments, *Canada, Pipelines, Installation costs.
Identifiers: *Ontario, Water installation charges.

The charges and assessments imposed by various Ontario municipalities on subdivision or industrial developments for installation of water service systems are detailed. In most new subdivisions the developer pays for a system that does not exceed 8 inches. About half of utilities pay for oversized mains--in excess of 6 inches. Most of the rest pay varying amounts according to a formula, which is different for virtually every municipality. In apartment developments, assessments vary from nothing to several hundred dollars per unit. It is difficult to establish what fraction of the levy is turned over to the water utility. In industrial developments the total cost of servicing is usually charged. However, there are relatively few service districts that make additional frontage charges for oversized mains. Although the Local Improvement Act offers the municipality the responsibility for providing fire protection, very few municipalities take this into account in their subdivision agreements. (Auen-Wisconsin)
W76-01606

DEMAND-RATE ECONOMICS,
Black and Veatch, Kansas City, Mo.
H. J. Lobb.
Journal American Water Works Association, Vol 67, No 5, p 247-250, 1975.

Descriptors: *Water rates, *Water demands, *Equity.
Identifiers: *Demand rates.

A substantial part of the annual costs of a water utility are related to providing and maintaining adequate system capacity to meet the maximum demands imposed upon the system, thus costs associated with meeting maximum demands should be properly recognized in the design of water rates. A demand rate for water service is a two-part rate in which customer charges are based upon both quantity of water used and the maximum rate of use and is more equitable than block-type rates. For example, any time the system's maximum demands are two or more times the average demand 50% or more of the system capital costs are allocable to demand capacity required. Studies of 11 water utilities indicated that extra capacity costs ranged from 30% to 46% of the total annual costs, or an average of 38%. Smaller users, as a group, characteristically have a maximum-to-average demand ratio that may require four additional units of extra capacity for every unit of water sold. Conversely, large users, as a group, have a ratio of maximum-to-average demand with extra capacity requirements of only one additional unit. Reduction or curtailment in maximum demands through appropriate charges can reduce the need for additional capital expenditures. (Auen-Wisconsin)
W76-01607

FORMULATION OF WATER RATES FOR BALTIMORE COUNTY, MD.,
Baltimore County Dept. of Public Works, Towson, Md.
W. J. Herberich.
Journal American Water Works Association, Vol 67, No 5, p 244-246, 1975. 5 tab, 1 ref.

Descriptors: *Water rates. *Formulation, *Public utilities, Water distribution(Applied), Water districts, *Maryland.
Identifiers: *Baltimore(Md).

The City of Baltimore operates all the water facilities in Baltimore County and faced a deficit of about $700,000 in fiscal 1973 unless the water rates for the county were revised. A water rate structure based on 'cash needs' through fiscal 1977 was formulated to meet the required revenue of $10.4 million. The minimum charge, based upon the ratio of capacity of a given meter size to the capacity of a 5/8-in. meter was not increased. The rating system for domestic usage was expanded from 5000 to 100,000 cu ft/quarter, thus combining the first two divisions of the sliding scale into one step. The intermediate step for usage between 100,000 and 1 million cu ft/quarter and the wholesale step for usage greater than 1 million cu ft/quarter were maintained. A service charge of $1.50/quarter for 5/8-in. meter and a commodity charge of $2.30/1000 cu ft of consumption in the domestic step were assigned which resulted in an annual charge at about $36 for an average domestic county customer. County constructed water facilities are not financed through the water rate structure but are financed by two annual charges and two one-time charges. (Auen-Wisconsin)
W76-01608

ECONOMIC IMPACT OF RECENT ENVIRONMENTAL LEGISLATION,
Water and Wastewater Equipment Manufacturers Association, Chicago, Ill.
R. Aldrich.
Industrial Water Engineering, p 12, 14, 16, 17, July/August 1973. 1 tab.

Descriptors: *Legislation, *Economic impact, *Pollution abatement, Industries, Recycling, Costs, Benefits, Financing.

The cost to industry necessary to bring pollution abatement facilities to meet existing or proposed environmental standards, in addition to capital cost should include operating and maintenance cost of these facilities; cost savings in possible recovery of waste material or energy; increased costs of raw materials and services due to pollution control by suppliers; size and age distribution of facilities; price elasticity or inelasticity inherent within any industrial classification; competitive factors--both at home and abroad; dependence on municipal waste treatment facilities by certain industry types and locations; and ability of industry to increase debt and how this relates to the individual corporation's potential growth. Although long-term pollution control costs will eventually be internalized, for the next five to ten years the impact of these additional costs must be alleviated. The primary need is to provide the lowest cost capital dollars with repayment scheduled over the longest period of time, thus reducing cash flow impact. This is best accomplished using 100% financing through tax-exempt pollution control industrial revenue bonds. Coupled with rapid depreciation of the pollution control facilities and the Investment Tax Credit amounts allowable, this financing technique can account for up to 30% in savings on the cost of the total investment. (Auen-Wisconsin)
W76-01610

TRUE COST OF CONVENTIONAL WATER,
Parsons, Brinckerhoff, Quade and Douglas, Inc., Denver, Colo.
F. W. Montanari, and D. E. Mattern.
Journal American Water Works Association, Vol 67, No 5, p 251-254, 1975. 6 fig, 1 tab, 4 ref.

Descriptors: *Water works, *Water costs, *Water sources, Water rates, Distribution.

The total costs and production costs of both private and municipal water utilities surveyed, grouped by population, are summarized. Utilities supplied primarily from ground water showed a higher unit cost for low production rates (up to 10,000 mil gal/yr) but a higher surface-water unit cost at incrased production rates. The 115 utilities reported serving about 67 million people. Of these, 109 serving about 45.3 million people reported about 8.4 million connections, and 92 serving about 33.1 million people reported a total of about 6.3 million residential connections and nearly 768,000 nonresidential connections. The aggregate production of the 115 utilities was almost 4.1 trillion gal/year. The average per capita production was about 186 gpd. The aberage total cost per person per year was about $18.50, or about 5 cents/person/day. Data by population groups broken down by source--ground, surface, and combinations--are shown. As the population range of the groups increases there are expected economies of scale. The effect of raising water rates in 68 cities was that 56 showed no effect on usage, one showed a decrease with a 50% rate incrase, three cities reported some decrease and eight reported a temporary or a slight effect. (Auen-Wisconsin)
W76-01611

TRENDS IN WATER RATES,
Black and Veatch, Kansas City, Mo.
C. W. Keller.
Journal American Water Works Association, Vol 67, No 5, p 255-257, 1975. 2 ref.

Descriptors: *Water rates, *Return(Monetary), Water works, Utilities.

The inflationary trend increases the propo rtion of revenues that must be devoted to operation and maintenance and the required investment per customer. Several methods of recovering water service costs are discussed. A recent trend has been to lessen the proportion of the cost to be refunded in local main installations and to shorten the allowed period of development. Many water systems make no refunds or require all main extensions to be installed by developers. Another trend has been to charge new customers a fee for 'back-up facilities.' The amount may range up to several thousand dollars per residential customer. If utility growth occurs because of added retail connections to a wholesale customer, one method is to charge a higher rate for use over a stated base amount. Current thinking in designing rate structures is presented in the AWWA Water Rates manual. That method usually results in usage of the meter block rate for the majority of customer classes and provides for unit charges that decrease as greater consumption levels are reached. Water price increases are only a slight deterrent to its use, as there is no elasticity in water demand, and would probable have little lasting effect on design of a major improvement. (Auen-Wisconsin)
W76-01612

HENRY GEORGE, PROPERTY RIGHTS AND ENVIRONMENTAL QUALITY: CLASSICAL ANSWERS TO 'NEW' PROBLEMS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 5G.
W76-01614

THE ECONOMICS OF THE WEST COAST OIL SPILL CLEAN-UP INDUSTRY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W76-01624

A LOW COST WASTE TREATMENT METHOD FOR THE DISPOSAL OF DISTILLERY WASTE (SPENT WASH),
Walchand Coll. of Engineering, Sangli (India).
For primary bibliographic entry see Field 5D.
W76-01626

CLEAN WATER WILL COST $159 BILLION.
For primary bibliographic entry see Field 5G.
W76-01784

EPA COMPLETES NEW PLANT AND SEWER INDEX DATA SERIES.
For primary bibliographic entry see Field 5G.
W76-01785

GOVERNMENT DOLLARS TO FUEL 18% GROWTH IN 1976 SEWERAGE MARKET.
For primary bibliographic entry see Field 5G.
W76-01794

ECONOMICS OF WATER SUPPLY PLANNING AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W76-01802

PLANNING WATER RESSOURCES DEVELOPMENT.
Economic Commission for Asia and the Far East (UN), New York.
For primary bibliographic entry see Field 6B.
W76-01818

MEASUREMENT STANDARDS FOR PROJECT EVALUATION--PRICES AND INTEREST BY THE ECAFE SECRETARIAT.
For primary bibliographic entry see Field 6B.
W76-01819

PROJECT COSTS.
For primary bibliographic entry see Field 6B.
W76-01820

IRRIGATION DEVELOPMENT COSTS AT THE FARM LEVEL.
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6B.
W76-01821

FINANCIAL ANALYSIS.
For primary bibliographic entry see Field 6B.
W76-01824

UP-DIP VERSUS DOWN-DIP MINING, AN EVALUATION,
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5G.
W76-01868

6D. Water Demand

DEMAND-RATE ECONOMICS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 6C.
W76-01607

FORECASTING URBAN WATER USE: COMMERCIAL ESTABLISHMENTS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, R. C. Sutherland, and J. R. Kim.
Journal American Water Works Association, Vol 67, No 5, 239-244, 1975. 4 tab, 7 ref.

Descriptors: *Water demand, *Water utilization, *Forecasting, Equations, Future planning(Projected).
Identifiers: *Shopping centers, Commercial water usage.

With more than 55% of the total U.S. employment in the service sector and the moratorium placed on new sewer-line hookups in many areas, water-use relationships for commercial establishments will be able to anticipate water demand. Relationships for estimating average daily water use are provided for department stores and mall shops located in shopping centers from data compiled in one shopping center in Greendale, Wisconsin, one in Baltimore, Maryland and two in suburban Washington, DC. Water-use relationships and the estimates of floor space for each 4-digit SIC (Standard Industrial Classification) category were used to estimate the potential water demand. Most water use in commercial establishments is currently for domestic-type purposes but planners of water-demand forecasting models should consider water demand for nondomestic purposes. The gross store area was used to drive water-use relationships because that variable is easier to determine than the number of employees per shift. The linear model containing both slope and intercept coefficients provided better estimates than the linear model that does not include the intercept coefficient. The layout and design characteristics, transportation balance, and labor productivity would probably be the most important system variables in commercial water-demand forecasting. (Auen-Wisconsin).
W76-01609

POSSIBLE IMPACTS OF OIL SHALE DEVELOPMENT ON LAND RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5C.
W76-01691

SALT RIVER PROJECT ANNUAL REPORT, 1974.
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 6B.
W76-01704

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ., Tucson. Div of Economic and Business Research.
For primary bibliographic entry see Field 6B.
W76-01709

ENERGY DEVELOPMENT IN THE ROCKY MOUNTAIN REGION: GOALS AND CONCERNS.
Federation of Rocky Mountain States, Inc. Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-01710

THE ROCKY MOUNTAIN REGION: A UNITY OF INTERESTS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-01712

RELATIONSHIP OF DISCHARGE REDUCTIONS TO AVAILABLE TROUT HABITAT FOR RECOMMENDING SUITABLE STREAMFLOWS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 4A.
W76-01809

WATER USE, SEMINAR DAMASCUS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 3F.
W76-01878

THE ROLE OF EFFECTIVE IRRIGATION WATER MANAGEMENT AT THE FARMER'S FIELD,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W76-01879

WATER USE IN IRRIGATION PROJECTS IN THE SYRIAN ARAB REPUBLIC,
International Commission on Irrigation and Drainage, New Delhi (India); and Syrian National Committee.
For primary bibliographic entry see Field 3F.
W76-01880

DETERMINATION OF WATER REQUIREMENTS IN IRRIGATION PROJECTS,
United Nations Development Program. Rome (Italy).
For primary bibliographic entry see Field 3F.
W76-01881

TECHNICAL ASPECTS OF WATER CONVEYANCE AND DISTRIBUTION SYSTEMS,
Agricultural Univ., Wageningen, (Netherlands).
For primary bibliographic entry see Field 3F.
W76-01886

6E. Water Law and Institutions

A COMPARISON OF DECISION MAKING AND ADMINISTRATIVE ORGANIZATION FOR MUNICIPAL WATER SUPPLIES IN MEDIUM-SIZED AND SMALL ILLINOIS MUNICIPALITIES,
Illinois Univ. at Urban-Champaign. Dept. of Agricultural Economics.
J. R. Van Es, H. Orr, and J. Quigley.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-107, $5.50 in paper copy, $2.25 in microfiche. Illinois University, Water Resources Center, Research Report No 106, October 1975, 107 p, 40 tab, 11 ref, 3 append. OWRT A-075-Ill. 14-31-0001-5013(1).

Descriptors: *Illinois, *Decision making, *Water supply, *Municipal water, *Cities, *Administration, *Organizations, Urbanization, Water management(Applied), Planning, Local governments.
Identifiers: Public decision making, Local planning, Urban water management.

The study was designed to provide information on the decision making and organizational characteristics of municipality owned water systems in small and medium-sized Illinois municipalities, and to relate these characteristics to municipal as well as other water system characteristics. Data on the municipal water systems of 228 Illinois incorporated municipalities were gathered through mail and telephone surveys, as well as from secondary sources. The municipalities were chosen as part of a 50 percent sample, stratified by size, of all incorporated municipalities in Illinois with populations between 1,000 and 50,000. In addition to selected descriptive information on the water systems, the data are reported under water system decision making; planning and financial management; and technical management. Attempts to determine the relationships between the dependent variables and municipal and water system characteristics indicated a general weakness or absence of such relationships. While the quality of the data cannot be ruled out with certainty as the reason for the absence of the relationships, it is suggested that the relative lack of active interest on the part of municipalities in their water systems may account for the findings. The historical absence of the necessity to actively manage the water system other than in a routine fashion may have left these water systems quite unprepared to meet future sudden challenges.
W76-01503

GENERALIZED CRITERIA FOR VERIFICATION OF WATER DEVELOPED THROUGH WEATHER MODIFICATION,
Bittinger M. W. and Associates, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W76-01519

WHAT'S NEW IN WATER TREATMENT.
For primary bibliographic entry see Field 5F.
W76-01561

MANAGING THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-01597

CONVENTIONAL WISDOM PLUS A NEW PHILOSOPHY--CORPS OF ENGINEERS WATER RESOURCE PLANNING,
J. L. Cannon.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-006-452, $4.00 in paper copy, $2.25 in microfiche. Army War College, Carlisle Barracks, Pa., December 2, 1974. 25 p, 1 fig, 18 ref.

Descriptors: *Water resources development, *Planning, *Water management(Applied), *Legislation, *Federal government, *Water policy, *Non-structural alternatives, Federal government, Water resources, Planning act, Land use, Land management, U.S. Water Resources Council.
Identifiers: Urban studies programs.

With data obtained from U.S. statutes, congressional documents and publications of federal agencies, this report examines the Corps authority and responsibility in national resource planning which includes developing studies of major river basins, flood plains, waste water management, structural design, and coordinating and assessing federal policies and programs. National economic development and environmental quality objectives are used by the Corps to develop consistent programs and plans. COE's largest planning effort, the urban studies program, integrates water resources management with locally determined regional goals by developing alternative plans which include a capital improvements element, management (non-structural) program and revision program which provides flexibility and responsiveness to possible changes in needs. Today's COE's activities involve all aspects of planning for water and related land resources development to further environmental quality, economic development, and other national policy guidelines while cooperating with local, state and regional governments. Planning capabilities of COE represent a significant national asset for water resources development, land use planning and environmental quality enhancement. (Salzman-North Carolina)
W76-01598

FLOOD MANAGEMENT DECISIONMAKING IN THE CONNECTICUT RIVER BASIN: ANALYSIS OF THE EXISTING LEGAL, FINANCIAL AND INSTITUTIONAL FRAMEWORK FOR FLOOD PLAIN MANAGEMENT,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6F.
W76-01599

ECONOMIC IMPACT OF RECENT ENVIRONMENTAL LEGISLATION,
Water and Wastewater Equipment Manufacturers Association, Chicago, Ill.
For primary bibliographic entry see Field 6C.
W76-01610

FUTURE WATER POLICIES,
Soil Conservation Service, Washington, D.C. River Basins.
E. C. Buie.
Journal of Soil and Conservation, p 211-213, September-October 1973.

Descriptors: *Water policy, *National Water Commission, Water resources development, Federal government, Local governments, Cost allocation, Channel improvement, Irrigation, Agriculture, Financing, Flood control, Flood plains, Erosion control, Sedimentation, Recreation, Wildlife, Reservoirs.

Some comments on the 1973 National Water Commission's report discuss its conclusions regarding the role of the federal government in water resources development particularly the recommendation and its impact that the state and local agencies assume full responsibility for flood control, irrigation, drainage, water supply, and navigation, and that identifiable beneficiaries bear the full costs of all developments for flood control and irrigation; it would also impose charges on users of inland waterways. Recommendations are made that evaluation reflect costs estimates of damages caused by increased downstream flood and sedimentation, lowering groundwater levels, fish and wildlife habitat losses, and esthetic values in channelization projects. The Commission recommends that federally funded water resource development projects resulting in increased food and fiber production be fully repaid. Eighteen recommendations for changes are offered in flood control efforts. The report discusses the various federal programs and state responsibilities in recreation reservoirs and fish and wildlife aspects. It suggests user fees for recreation and does not recommend full federal funding for the recreational aspects of these developments. Major adjustments in the engineering responsibilities of the Soil Conservation Service, Army Corps of Engineers and the Bureau of Reclamation are suggested. There appears to be some dichotomy in recommendations for rural water development. (Auen-Wisconsin)
W76-01617

THE CONCEPT OF WATER RESOURCES DEVELOPMENT,
Central Water and Power Commission, New Delhi (India).
For primary bibliographic entry see Field 6B.
W76-01618

INSTITUTIONAL BEHAVIOR CONCERNING RIVER BASIN MANAGEMENT LEGISLATION,
Doane Coll. Crete, Nebr.
E. J. McPartland.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 326, $5.50 in paper copy, $2.25 in microfiche. Comple-

tion Report, 1975. 115 p, 23 tab, 32 ref. OWRT C-5071 (No 4202) (1).

Descriptors: Natural Resources, *Decision making, Administration, *Legislation, Planning, *Watershed management, *River basin development, *Nebraska, *Institutions, Political aspects, Water policy, Attitudes, Legal aspects, Water law.
Identifiers: *District reorganization, District boundaries, Policy formulation, Legislative behavior, Administrative behavior, Lobbying, Interest groups, Constituency influence.

This research was a case study and analysis of the most salient influences in the enactment of Natural Resources District legislation in the state of Nebraska. Research methods included extensive analysis of documents, open-ended interviews, and quantitative analysis of roll-call voting. The research results showed that reorganization legislation was the culmination of a six year controversy between a relatively small well-informed group of people with a great interest in soil and water conservation. The controversy was aired before an apathetic public and a Legislature that was not particularly familiar with the issue. The research further indicated that the level of public understanding was low, that there was considerable lobbying activity by various interests, that a few key individuals both in and out of the Legislature had a great impact on the controversy, that lobbying in some districts had an impact on the voting of legislators, that rural legislators were divided on the issue while urban legislators generally supported reorganization, and that some of the customs and practices of the Nebraska Legislature enhanced passage of the reorganization legislation.
W76-01682

SUMMARY OF 1975 ROCKY MOUNTAIN LAND USE AND NATURAL RESOURCE BILLS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
October, 1975. 53 p, 1 tab.

Descriptors: *Rocky Mountain Region, *Land management, *Water management(Applied), *Natural resources, *Legislation, Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming, Water conservation, Water resources, *Land use, Land resources, Administration, Planning, Water law, Legal aspects.
Identifiers: Natural resources development, Natural resource bills.

A summary is provided of state legislative activity affecting land use and development of the natural resources of the Rocky Mountain states: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming. The bills summarized include water legislation, mineral taxes, impact areas' taxes, plant siting laws, conservation, environmental protection, reclamation, land use, manpower training, research units and interim committees, and other natural resource issues. Water legislation is divided into allocation, minimal requirements, agricultural properties, quality, and state's rights. Each bill is listed, briefly summarized, and its failure or passage is indicated. (Robinett-Arizona)
W76-01711

R AND D PRIORITIES ON THE NATIONAL AGENDA FOR WATER POLLUTION CONTROL,
Water Pollution Control Federation, Washington, D.C. Research Committee.
For primary bibliographic entry see Field 5G.
W76-01733

ENVIRONMENTAL CHEMISTRY IN THE NETHERLANDS,
Waterloo Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-01734

FACILITIES PLANS: CLEARING UP THE CONFUSION,
For primary bibliographic entry see Field 5G.
W76-01782

SAFE DRINKING WATER ACT, ACT I SCENE I OF HERE WE GO AGAIN,
For primary bibliographic entry see Field 5G.
W76-01788

LOCAL LAND USE CONTROL OVER CRITICAL AREAS,
American Society of Planning Officials, Chicago, Ill.
C. Thurow.
Civil Engineering-ASCE, Vol 45, No 9, p 73-76, September, 1975. 4 fig.

Descriptors: *Land use, *Local governments, Environmental control, State governments, Legislation, Permit, Developed waters, Standards, Groundwater, Sand aquifers, Wetlands, Streams.
Identifiers: Land development, Special interest groups.

States can no longer handle all of the environmental problems and decisions that may develop. Along the southeastern coast of Texas recently, the sand aquifier has been heavily pumped, causing groundwater to be extracted faster than it could be replaced. Expensive problems have developed. The willingness of local communities to become involved in regulating local environmental problems is discussed. The planner in a community is the best qualified on a local level to judge what degree and type of development a particular area will tolerate. The other approach is by making local ordinances prohibiting certain types of development or limiting use of such areas as wetlands or streams. Most ordinances remain simple, allowing light use or use with a special permit, but some have moved beyond that stage. Very few have been challenged in court, the most important reason being that they are more flexible than they appear. Their main purpose is to insure the involvement of local government in the development process. They force a case by case administrative process, requiring more time and more expertise on the local level. Disadvantages that may arise are the probabilities of human error in difficult decisions and pressure from special interest groups. Environmental performance standards can overcome some of the difficulty, by promoting compatible development. (Pinto-FIRL)
W76-01790

REGIONAL INSTREAM FLOW NEEDS IN THE PACIFIC NORTHWEST: AN ANALYSIS OF INSTITUTIONAL, LEGAL, AND TECHNOLOGICAL ASPECTS OF ALLOCATION PROCESSES FOR LIMITED STREAMFLOW,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 6B.
W76-01797

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART I, EFFECT OF THE 'REVIEW AND COMMENT PROCESS' ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01800

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01801

AN INNOVATIVE ORGANIZATIONAL ARRANGEMENT FOR COMPREHENSIVE WATER SERVICES: THE THAMES WATER AUTHORITY AS A MODEL FOR COMPLEX AREAS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. W. Bulkley, and T. A. Gross.
Available from the National Technical Information, Springfield, Va 22161 as PB-247 462, $6.00 in paper copy, $2.25 in microfiche. Completion Report Institute of Water Research, Michigan State University, East Lansing. September, 106 p, 3 fig, 1 tab, 29 ref, 3 append. OWRT A-083-MICH(1). 14-31-0001-5022.

Descriptors: *Water resources management, *Urban areas, *Institutions, *Foreign research, Cities, Public utilities, Water policy, Public utility districts, Municipalities, Planning, Organizing, *Organizations, *Great Lakes.
Identifiers: *Thames Water Authority, *Comprehensive water services, Chicago, Detroit, Cleveland, England, Wales.

A need exists for regional consideration and evaluation of comprehensive water services in complex urban areas. The Thames Water Authority (TWA) in England provides such comprehensive water services to the entire Thames River Basin including metropolitan London; an area of 5000 square miles with a population of 12 million. In recognition of the possible application of such a concept to complex urban areas of the Great Lakes, the principal investigator spent six months as a participant-observer with the Authority and provides a detailed description of its organization and operation. In addition, criteria are established by which water services in complex urban areas may be evaluated and the TWA is so evaluated. Preliminary evaluations are also provided for Chicago, Detroit and Cleveland.
W76-01815

PLANNING WATER RESSOURCES DEVELOPMENT.
Economic Commission for Asia and the Far East (UN), New York.
For primary bibliographic entry see Field 6B.
W76-01818

SOCIAL AND NON-ECONOMIC CONSIDERATIONS IN WATER RESOURCES PLANNING AND DEVELOPMENT.
For primary bibliographic entry see Field 6B.
W76-01825

CO-ORDINATING THE ACTIVITIES OF ALL AGENCIES GOVERNING WATER RESOURCES DEVELOPMENT AND RELATED FIELDS.
For primary bibliographic entry see Field 6B.
W76-01826

WATER USE, SEMINAR DAMASCUS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 3F.
W76-01878

IRRIGATION ORGANIZATIONS,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W76-01889

THE COMMON HERTIAGE OF MANKIND AS A LEGAL CONCEPT,
Connecticut Univ., Storrs. School of Law.
R. P. Arnold.
The International Lawyer, Vol 9, No 1, p 153-158, 1975. 6 p, 16 ref.

Descriptors: *Subsoil, *Ownership of beds, *Jurisdiction, *International law, *Mining, Treaties, Natural resources, Legal aspects, Submerged lands, United Nations, Foreign countries, Boundaries(Properly), International waters, Beds, Resources development, Resources, Oceans, Mineral industry.

The United Nations General Assembly Resolution 2749, 'Declaration of Principles Governing the Seabed and the Subsoil Thereof, Beyond the Limits of National Jurisdiction', states that the seabeds resources are the 'common heritage of mankind'. Many jurists have complained that this term 'common heritage of mankind' expresses no legal concept. The author, however, believes the phrase carries a clear judicial connotation: worldwide common ownership of the seabed and its resources beyond the limits of national jurisdiction. Viewed from this perspective, the phrase can be said to create a legal rule of joint property in the seabed and its resources, thus preventing an individual state from exercising its individual right to property held jointly with the other states of the world. Under this rule, individual state would be able to mine the seabed, but subject either to terms of consent as expressed in some international treaty or to some form of benefit sharing. Such a rule is a necessary acknowledgement that environmental protection and sharing of world resources is in the best interest of all nations. (Hoffman-Florida)
W76-01952

IN MEMORIAM: RAINBOW BRIDGE NATIONAL MONUMENT,
For primary bibliographic entry see Field 6G.
W76-01953

THE FISHERIES JURISDICTION CASES: THE CONTRIBUTION OF THE INTERNATIONAL COURT OF JUSTICE TO THE DEBATE ON COASTAL STATES' FISHERIES RIGHTS,
British Inst. of International and Comparative Law, London (England).
R. R. Churchill.
International and Comparative Law Quarterly, Vol 24, Part 1, p 82-105, 1975. 24 p, 53 ref.

Descriptors: *International Law, *Commercial fishing, *United Nationa, *Boundary disputes, *Territorial waters, Conferences, Fisheries, Treaties, Preferences(Water rights), Jurisdiction, International waters, Atlantic Ocean, Europe, Judicial decisions, Law of the Sea, International Commissions, Coasts.
Identifiers: *U.N. Conference on the Law of the Sea, Iceland, International Court of Justice, Great Britain, West Germany, Coastal states.

One of the central issues before the Third U.N. Conference on the Law of the Sea is the extent of coastal States' rights over living resources. Midway through this meeting, the International Court of Justice decided two important fisheries jurisdiction cases dealing with this problem. Iceland and Great Britian and Iceland and West Germany were the litigants. Following a failure of the international conference to agree on the breadth of the territorial sea, Iceland extended its exclusive fishing zone to fifty miles. The two applicant states sought a determination of whether Iceland's claim was contary to international law, and whether conservation of fish stocks was subject to international regulation. A majority of the Court held that Iceland had preferential rights in waters beyond the twelve mile limit, but refused to say that such rights have a basis in international law. Preferential rights exist when a coastal State is special dependent on coastal fisheries. This theory is of debatable validity since it stems from customary rather than legal precedent. (Jenkins-Florida)
W76-01954

COMPREHENSIVE WETLANDS PROTECTION: ONE STEP CLOSER TO FULL IMPLEMENTATION OF SECTION 404 OF THE FWPCA.
Environmental Law Reporter, Vol 5, No 7, p 10099-10104, July, 1975. 6 p, 28 ref.

Descriptors: *Navigable waters, *Wetlands, *Federal Water Pollution Control Act, *Federal jurisdiction, *Administrative agencies, Judicial dicisions, Fish reproduction, Wildlife habitats, Environment, Flood control, Ecology, Ecosystems, Environmental effects, Marshes, Tidal marshes, Regulation, Permits, Water conservation, Preservation.
Identifiers: *Ecological functions, *FWPCA Amendments of 1972.

There has been considerable disagreement concerning the scope of federal regulatory jurisdiction over dredge and fill activities throughout the nation under Section 404 of the Federal Water Pollution Control Act Amendments of 1972. A recent court ruling has held that Section 404 expands the Army Corps of Engineers' jurisdiction over the depositing of dredged or fill material to 'waters of the United States', and not just to 'navigable waters'. The former term is much broader, encompassing non-tidal, inland wetlands which provide areas vital to fish propagation, natural flood control, and wildlife habitat. As a result of this decision, the Corps, which favored the more restrictive interpretation, published proposed revised regulations concerning its permit jurisdiction under Section 404. The Corps accompanied publications of the proposals with a press release aimed at stirring up public sentiment against the enlarged jurisdiction of Section 404. The facts and reasons behind the Corps negative reaction to a broad reading of Section 404 are explored in detail. (Hoffmand-Florida)
W76-01955

MARICULTURE: A NEW OCEAN USE,
Georgia Univ., Athens. Inst. of Government.
J. O. Smith, and D. L. Marshall.
Georgia Journal of International and Comparative Law, Vol 4, p 307-342, 1974. 36 p, 246 ref.

Descriptors: *Marine plants, *Aquatic plants, *Jurisdiction, *International law, International waters, Oceans, Marine biology, Water types, Law of the Sea, Estuaries, Foods, Food abundance, Productivity, Standing crops.
Identifiers: *Mariculture, *Coastal waters, Contiguous zone, Marine sanctuaries.

The authors suggest that future world food requirements may lead to use of territorial waters and high seas for purposes of mariculture--the artificial culture of marine organisms. A coastal nation's sovereignty diminishes seaward of the shoreline, and so possible international interference with American entrepreneurial efforts in this regard will increase proportionally to the distance of a given enterprise from American territory. Examples of maricultural endeavors include transplantation of clams and oysters to improved habitats and the maintenance of cultures of shellfish and free-swimming fish in enclosures suspended near the water surface. The authors conclude that the barriers to these enterprises represented by international law of the sea are not as great as might be expected, even in the realm of the high seas. Mariculture activities are legally distinguishable from extant ocean uses and should be treated differently from such practices as fishing, navigation, and mineral exploration and exploitation. The authors survey the state of relevant existing law as it affects maricultural purposes in each of five ocean areas: (1) territorial waters between the coastal baseline and a line three miles seaward; (2) the contiguous zone, between three and five miles from the baseline; (3) the high sea beyond twelve miles; (4) the submerged lands under the territorial sea; and (5) the continental shelf. (Gerlach-Florida)
W76-01956

INVENTORY AND QUANTIFICATION OF FEDERAL WATER RIGHTS: A COMMON DENOMINATOR OF PROPOSALS FOR CHANGE,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
W. Kiechel, Jr.
Conference 'Water Law Issues--'75', Section of Natural Resources Law, ABA, Denver, Colorado, February, 1975. 15 p.

Descriptors: *Reservation Doctrine, *Federal jurisdiction, *Federal-state water rights conflicts, *State jurisdiction, Water rights, Water law, Water, Water control, Legislation, Water utilization.
Identifiers: *Sovereign immunity, *Citizen suits, *Standing(Legal).

This speech analyzes a bill which would require the inventorying and quantification of federally reserved rights to bodies of water. The United States owns the right to use the waters upon, within, and adjacent to the public domain which have not previously been appropriated by others under authority of an act of Congress. When public lands are withdrawn or reserved for authorized purposes requiring the use of water, the United States also reserves the right to use a sufficient amount of the unappropriated waters pertaining thereto to accomplish such purposes. These 'reserved rights' have been the subject of criticism and controversy and have created a great deal of friction between state and federal agencies. To alleviate these problems, the proposed legislation would require, inter alia, the head of each federal agency within five years after enactment to prepare an inventory of all reserved, appropriative, and other water rights under the administrative juridsdiction of that agency within each state. The bill further authorizes the maintenance of suits against the United States for judicial review of the rights listed in the inventorial and of administrative determinations in their listing and quantifications. Such review can be accomplished without resort to general adjudication proceedings. The author contends that the process of inventory and quantification, with judicial review of the nature described, is preferable to general judicial proceedings in state courts for purposes of removing the 'mystery' which has cloaked the federal reserved rights doctrine in the past. (Gerlach-Florida)
W76-01957

ANTITRUST AND POLLUTION CONTROL: AN EPA PERSPECTIVE,
Environmental Protection Agency, Washington, D.C. Office of General Counsel.
For primary bibliographic entry see Field 5G.
W76-01958

WATER QUALITY STANDARDS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PRODUCTIVE BUT UNREALISTIC,
For primary bibliographic entry see Field 5G.
W76-01959

INTEGRATING GROUND AND SURFACE WATER USE IN AN APPROPRIATION STATE,
Davis, Graham and Stubbs, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-01960

THE FUTURE OF ENVIRONMENTAL DEFENSE,
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-01961

IMPROVEMENT OF THE QUALITY OF WATER SUPPLY SOURCES (POLICY STATE-

MENT OF AMERICAN WATER WORKS ASSOCIATION).
Journal of the American Water Works Association, Vol 67, No 8, p A19-A20, Aug. 1975, 2 p.

Descriptors: *Water resources development, *Water supply, *Water quality control, *State governments, *Planning, Water purification, Water quality standards, Costs, Industrial water, Beneficial use, Water allocation(Policy), Priorities, Research and Development, Administration, Federal government, Education, Recreation, Water utilization, Water demand.
Identifiers: State policy.

Protection and improvement of industrial and municipal water supplies is the goal of the American Water Works Association Journal. Enhancement of the economic value of water for industrial use, and safeguarding of the sanitary and aesthetic value of domestic water, cannot be achieved by effluent limitations alone. Careful planning is of paramount importance. Furthermore, state governments should have primary responsibility for water quality control, since nationwide discharge standards are unrealistic and uneconomical. However, continuing federal financial assistance will be necessary for some states. Other proposals include: (1) greater use of water quality improvement techniques such as low flow augmentation, watershed management, and control of saline water sources; (2) intensification of research and development efforts, especially in the area of physiological effects of contaminants; (3) strengthening of programs to train personnel for the water supply industry; and (4) education of the public in more efficient methods of water usage. (Jenkins-Florida)
W76-01962

THE SAFE DRINKING WATER ACT AND EPA'S ROLE IN TRAINING,
Environmental Protection Agency, Washington, D.C., Division of Water Supply.
For primary bibliographic entry see Field 5G.
W76-01963

CAN NEW YORK'S WETLANDS BE SAVED. A CONSTITUTIONAL AND COMMON LAW SOLUTION,
J. L. Stockholm.
Albany Law Review, Vol 39, No 3, p 451-493, 1975. 42 p, 299 ref, 1 append.

Descriptors: *Wetlands, *Constitutional law, *New York, *Land use, *Ownership of beds, Legislation, Water law, Conservation, Aquatic environment, Regulation, Land management, Land resources, Non-structural alternatives, Land classification, Marshes, Water injury, State governments, Federal government, Judicial decisions.
Identifiers: Fifth Amendment, Police power.

New York passed a Tidal Wetlands Act in 1973 placing a temporary moratorium on all development in the wetlands until land use regulations are issued. Because the fragile nature of the wetlands requires that strict use limitations be imposed to protect them, a fifth amendment 'taking' challenge will likely follow the issuance of the regulations. This comment attempts to anticipate that challenge and show how the Act and its regulations can be upheld. It first examines the extent of the state's interest in protecting the wetlands and the necessity of finding some valid method of conservation. Then the history of the fifth amendment taking clause is surveyed, as well as factors which will play a vital role in balancing whether the regulations are a valid exercise of the state's police power or whether they constitute a 'taking'. Finally, a review is made of the state's property interests in the wetlands and some proposals advanced concerning the courses of action available to the state. One additional factor the state must take into consideration is the 1975 Supreme Court decision in United States v Maine in which the federal government was declared to have paramount right and title to the seabeds beyond the three - mile limit. (Hoffman-Florida)
W76-01964

INTERNATIONAL STRAITS: THE RIGHT OF ACCESS,
Army Staff Judge Advocate's Office, Berlin (Germany).
R. P. Cundick.
Georgia Journal of Inter and Comp Law, Vol 5, No 1, p 107-140, 1975, 34 p, 102 ref.

Descriptors: *Access routes, *Navigation, *Straits, *International law, *Coasts, Channels, Inland waterways, Law of the sea, Military aspects, Navigable waters, Reasonable use, Foreign trade, International waters, Ships, Treaties, Conferences, Foreign countries.
Identifiers: International conferences, Territorial seas, Innocent passage, Free passage.

The expansion of claims to the territorial sea by coastal states has caused serious problems concerning the right of access to international straits. The proposals attempting to address these problems fall into two general categories: those advocating an innocent passage regime, and those advocating a free passage regime. Innocent passage, applicable within the territorial sea of a state, permits transit only by above water vessels which do not threaten the peace and security of the coastal state. Free passage permits navigation by all vessels and aircraft, without distinction. This article analyzes the varying effects these two approaches would have on various problems including: (1) sovereignty and access respecting the sea; (2) access to ports; and (3) access from high seas to high seas. Also presented are historical data on numerous international conferences, treaties, and special agreements which have dealt with the problem of free access. Most of these conferences and treaties have shown a trend toward greater freedom of access. (Hoffman-Florida)
W76-01965

DEEPSEA ADVENTURES: GROTIUS REVISITED (PRIVATE CORP. CLAIM TO DEEPSEA MINERAL RIGHTS),
Inter American Development Bank Washington, D.C. Legal Dept.
G. Biggs.
International Lawyer, Vol 9, No 2, p 271-281, 1975, 11 p, 22 ref.

Descriptors: *Law of the Sea, *Jurisdiction, *International law, *Exploitation, *Continental shelf, Natural resources, Mining, Leases, Exploration, Leases, Withdrawal, Mexico, Oceans, Water utilization, Consumptive use, Economics, Beds, Ownership of beds, Boundary disputes, Foreign countries, United States, Exploration, Manganese.
Identifiers: *Coastal states, *Mineral deposits.

Several important issues are raised by the claim of Deepsea Ventures, Inc. to exclusive mining rights on the eastern Pacific Ocean some 1,300 kilometers off the coast of Mexico. Deepsea has filed two documents with the Secretary of State of the United States; a Notice of Discovery and Claim of Exclusive Mining Rights, and a Request for Diplomatic Protection and Protection of Investments. In these documents Deepsea asserts exclusive rights to develop and mine the deposit and to take, use and sell all metals derived therefrom. One of the legal premises for Deepsea's claim is a positive rule of international law which permits the acquisition of exclusive rights to explore and exploit manganese nodules in the seabed beyond national jurisdiction. Diplomatic protection, however, is necessary for the preservation and exercise of such rights. Furthermore, Deepsea contends its claim is supported by the Convention on the High Seas which specified exploitation of resources on the abyssal ocean floor to be a freedom recognized by general principles of international law. The author disputes the validity of Deepsea's claim and presents evidence rebutting its arguments. (Hoffman-Florida)
W76-01966

CRIMINAL PROSECUTION UNDER THE ALASKA ENVIRONMENTAL CONSERVATION ACT OF 1971: STOCK V STATE,
For primary bibliographic entry see Field 5G.
W76-01967

LOCAL REAPPORTIONMENT: THE EXEMPTION OF WATER MANAGEMENT DISTRICTS,
Virginia Polytechnic and State Univ., Blacksburg. Dept. of Political Science.
P. L. Martin.
Santa Clara Lawyer, Vol 14, No 1, p 31-45, 1973. 15 p, 97 ref.

Descriptors: *Constitutional law, *Water districts, *Public utility districts, *Governments, *Population, Judicial decisions, Water law, Legal review, Watershed management, Economics, Density, Drainage districts, Legal aspects, Institutional constraints, Political aspects, State government.
Identifiers: Reapportionment, Elections.

In Reynolds v Sims, the Supreme Court declared that in accord with the Constitution a state must make 'an honest and good faith effort to construct districts in both houses of its legislature, as nearly of equal population as is practicable.' Subsequent decisions, however, left room for equal apportionment exemptions. These decisions recognized that there might be some cases in which a State elected certain functionaries whose duties are so far removed from normal governmental activities and whose effects on different groups are so disproportionate that a popular election in compliance with Reynolds might not be required. Two recent Supreme Court decisions found such an exemption applicable. In one, a water management district was classified as a government of special powers because it did not perform normal governmental duties. The Court also found the financial burden of the district to be distributed in the same manner as the right to vote. In the other case, the Court upheld a statue allowing a watershed improvement district referendum permitting only landowners in the affected area to vote. Thus, while the 'one person, one vote' philosophy pervades all levels of government, variations of local apportionment have been approved in the past and will continue to raise questions about representation in the future, especially in areas of ecological concern. (Hoffman-Florida)
W76-01968

WATER MANAGEMENT IN ONTARIO--AN ECONOMIC EVALUATION OF PUBLIC POLICY,
British Columbia Univ., Vancouver. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-01969

TOWARD AN INTERNATIONAL STANDARD OF ENVIRONMENT,
Georgetown Univ., Washington, D.C. School of Law.
G. P. Smith, II.
Pepperdine Law Rev, Vol 2, No 1, p 28-51, 1974. 23 p, 66 ref, 1 append.

Descriptors: *International waters, *International Commissions, *Environmental effects, *United Nations, Political aspects, Institutional constraints, Political constraints, Costs, Economic impact, Planning, Ecology, Welfare(Economics), Pollution, Standards, Regulation, Coordination.
Identifiers: *Earthwatch, Environment Project, U. N. Conference on the Environment, Draft

Declaration on the Human Environment, Third World.

Economic development generally takes precedence over environmental protection in Third World Countries. This and other factors complicating achievement of international environmental standards were discussed in 1972 at a conference on environmental management held in Stockholm, Sweden. Views of the conference are incorporated in the Draft Declaration on the Human Environment. An Action Plan spells out three steps necessary to solve global environmental problems. The first step is a monitoring and evaluation network called Earthwatch which includes the creation of an international mechanism for the exchange of information. Environmental management of certain activities at an international level is a second element while support activities for the other two facets of Action Plan constitute the third. The Conference issued nine other proposals relating to specific environmental issues. The U.N. General Assembly did not formally approve the Declaration, but did establish a United Nations Environment Program centered in Nairobi. The purpose of the Stockholm Conference was to focus world attention on environmental problems. Solutions to those problems should follow. (Jenkins-Florida)
W76-01970

TEST CASE ON OCEAN DUMPING: MUST PHILADELPHIA MOVE TOWARD ON-LAND DISPOSAL OF SEWAGE SLUDGE.
For primary bibliographic entry see Field 5G.
W76-01971

E L I CONCLUDES WATER ACT ENFORCEMENT STUDY.
For primary bibliographic entry see Field 5G.
W76-01972

GINN V ANDREWS (ACTION FOR INJUNCTION AND DAMAGES AGAINST LOWER ADJOINING LANDOWNERS FOR FLOODING).
310 So 2d, 424-425, (1st DCA FLA, 1975), 2 p.

Descriptors: *Florida, *Backwater, *Standing waters, *Drainage effects, *Adjacent landowners, Surface run-off, Surface waters, Drainage systems, Surface drainage, Judicial decisions, Penalties(Legal), Rain water, Water levels, Flooding, Drainage, Controlled drainage, Drainage water, Legal aspects, Water law, Water rights, Overland flow.
Identifiers: Injuctions, Upper adjoining landowner, Lower adjoining landowner, Intentional torts.

Upper adjoining landowners brought an action against the lower adjoining landowners for mandatory injunction and damages alleging that a dirt fill placed on defendants' land caused an increase in the amount of standing water on plaintiffs' property. The defendants created the dirt fill for the purpose of building a patio on a concrete slab. The structure impeded and obstructed the natural drainage of water from plaintiff's lot, and caused the standing water. The trial court ordered defendant's to restore the natural drainage and awarded plaintiff damages. Defendants appealed urging that since the land of both parties abut Black Creek, plaintiffs should provide drainage from their land directly to the creek. The District Court rejected this argument and in affirming liability, held that an upper adjoining owner has a servitude on the land of the lower adjoining landowner in respect to water naturally flowing onto the lower land. However, the judgment awarding damages was unused because the trial court awarded damages exceeding the pleadings. (Hoffman-Florida)
W76-01973

MORELAND V ACADIAN MOBILE HOMES PARK, INCORPORATED (INTERFERANCE WITH NATURAL DRAINAGE).
313 So, 2d 877-86 (La. App 1975), 10 p.

Descriptors: *Louisiana, *Judicial decisions, *Drainage systems, *Penalties(Legal), *Sewage effluents, Legal aspects, Water law, Drainage, Controlled drainage, Drainage engineering, Drainage water, Drainage effects, Water control, Water conveyance, Discharge(Water), Effluents, Sewage disposal, Conveyance structures, Competing uses.
Identifiers: Injunctive relief, Swales, Servitudes.

Plaintiff homeowners brought an action against defendant mobile home park for damages and to enjoin defendant from discharging effluents into a drainage swale running through plaintiffs' property. The effluents were discharged from a sewage disposal system installed in connection with the mobile home park. Defendant contended that no alteration was made in the natural drain running across its property, and that it was impossible for defendant to restrict its use of the natural drain so as to comply with plaintiffs' demands. The Second Circuit Court of Appeal of Louisiana held that, while under Louisiana law, a servitude is created when the estate situated below receives waters running naturally from the estate situated above, the installation of the sewage disposal plant on defendant's property constituted a substantial change in the nature of the servitude, rendering it more burdensome to plaintiffs. However, since the effluent had no odor and presented no health hazard, damages rather than injunctive relief was the appropriate remedy. (Nursey-Florida)
W76-01974

GENE B. GLICK COMPANY, INC. V MARION CONSTRUCTION CORP. (DISCHARGE OF WATER FROM UPPER WATERSHED).
331 N.E. 2d. p 26-39 (Indiana, Court of Appeals 1975), 14 p.

Descriptors: *Indiana, *Judicial decisions, *Drainage systems, *Drainage effects, *Penalties(Legal), Legal aspects, Water law, State governments, Controlled drainage, Drainage water, Ditches, Sewers, Water control, Water conveyance, Discharge(Water), Subsurface drainage, Drainage engineering.
Identifiers: Injunctions(Mandatory).

Plaintiff, owners of lower lands, brought an action seeking injunctive relief and damage for the discharge of water from an upper watershed area. Defendant subdivision developer had established, by a system of interconnected ditches and subterranean storm sewers, a drainage system which concentrated the discharge of drainage from the upper watershed area onto plaintiffs' land causing flooding in this lower land. The First District Court of Appeals of Indiana held that, although the owner of the upper watershed could properly collect normal quantities of water which fill on his land and direct them to channels on his property, he could not direct the concentrated waters to a point where no natural watercourse existed, or so increase flowage as to cause damage to lower property. The court held that the increased drainage flow caused permanent injury to plaintiffs' property and, therefore, monetary damages was the proper legal remedy. (Nursey-Florida)
W76-01975

SUN ENTERPRISES, LTD V TRAIN (DREDGING AND SEWAGE DISPOSAL IN WETLANDS).
394 F Supp. 211-25 (S.D. New York, 1975), 15 p.

Descriptors: *Sewage disposal, *Wetlands, *Permits, *Federal Water Pollution Control Act, *Administrative decisions, Environmental effects, Judicial decisions, Dredging, Regulation, Administrative agencies, Adjudication procedure, Water law, Navigable waters, Water pollution sources, Sewage effluents, Jurisdiction.
Identifiers: Development projects, Administrative authority.

A real estate developer was issued a permit by the Environmental Protection Agency authorizing the discharge of sewage treatment effluent into state waters. Subsequent to the issuance of the permit, plaintiff wetland owners brought this action against the developer and particular government officials seeking various forms of relief from the dredging and sewage disposal activities of the developer. The court dismissed all claims against the government officials, finding that they did not violate any of their duties in issuing the permit under the Federal Water Pollution Control Act (FWPCA). The court, however, allowed to stand a claim for relief against the developer for discharging dredged or fill materials into waters of the U.S. without a Corp of Engineers permit in violation of the FWPCA. The developer asked for a dismissal of the claim, contending that the permit was not required because the receiving body was not a 'navigable water' as required by the Act. The court held that the purposes of the FWPCA require 'navigable waters' to be broadly defined so as to include all water bodies for water quality purposes. Thus, the traditional narrow definition of 'navigable waters' was held not to be controlling when applied to the FWPCA. (Hoffman-Florida)
W76-01976

UNITED STATES V RESERVE MINING COMPANY (DISCHARGE OF TACONITE TAILINGS INTO LAKE SUPERIOR).
394 F Supp 233-45 (D. Minnesota, 1974), 13 p.

Descriptors: *Mine wastes, *Minnesota, *Navigation, *Judicial decisions, *Permits, Water pollution sources, Water pollution effects, Public health, Environmental effects, Legal aspects, Regulation, Navigable waters, Water quality control, Water quality standards, Law enforcement, Water policy, Mineral industry, State government, Federal government, United States.
Identifiers: Refuse Act, Estoppel.

The United States and various state plaintiffs brought this action charging defendant mining company with statutory violations of the Refuse Act arising out of defendant's discharge of taconite tailings into Lake Superior. Since defendant had a Refuse Act permit, the major issue was whether the terms of the permit sanctioned the specific conduct that was challanged by plaintiffs. The Refuse Act had been consistently construed to be applicable only to those discharges impeding navigation. Recently, however, courts have given the Act a broader construction and extended its coverage to discharges that are harmful without respect to their effect on navigability. Following this trend, the court found that defendant's discharges were not sanctioned by the Act. Nevertheless, defendant contended that the principles of estoppel should preclude plaintiffs' claim, since defendant's permit was reissued in 1960 when the prevailing view that the only proper consideration under the Refuse Act was the effect a particular discharge might have on navigability. The court held, however, that the government's claim was not estoppel because of the issuance of the permit. In so holding, the court took judicial notice of public health considerations and various other factors. (Hoffman-Florida)
W76-01977

P F Z PROPERTIES, INC V TRAIN (DREDGING AND DEVELOPMENT OF MANGROVE WETLANDS).
393 F Supp, 1370-1382 (D DC 1975), 13 p.

Descriptors: *Federal Water Pollution Control Act, *Navigable waters, *Dredging, *Mangrove swamps, *Permits, Legislation, Wetlands, Environmental effects, Legal aspects, Jurisdiction,

Water law, Water pollution sources, Balance of nature, Judicial decisions, Classification, Construction, Landfills.
Identifiers: Biological productivity, Injunctions.

Plaintiff developer was dredging and filling mangrove wetlands in order to construct an apartment complex when charged with violation of the Federal Water Pollution Control Act (FWPCA) for discharging dredged materials into waters of the U.S. without a permit from the Environmental Protection Agency (EPA). Plaintiff brought this action for declaratory and injunctive relief against the Administrator of the EPA, contending that the mangrove wetlands were not 'waters of the U.S.' within the meaning of the FWPCA, and thus not subject to the Act's permit requirements. Defendants relied on three grounds in asserting jurisdiction over the wetlands. First, they asserted that the wetlands were navigable waters of the U.S. by virtue of a canal extending through them which was used for commercial purposes in the past. Second, they asserted that the wetlands were 'waters of the U. S.' because of the biological productivity and importance of the area. Finally, the wetland waters are a potential source from which pollutants may flow into recogined navigable waters. The court, finding all three assertions to be supported by the evidence, held that plaintiff's development was subject to the permit requirements of the FWPCA and denied any relief. (Hoffman-Florida)
W76-01978

CHOCTAW NATION V CHEROKEE NATION (DISPUTE OVER TITLE TO BED OF ARKANAS RIVER).
393 F Supp, 224-246, (ED Okla 1975), 23 p.

Descriptors: *Oklahoma, *Treaties, *Ownership of beds, *Boundary disputes, *Indian reservations, Judicial decisions, Legal review, Beds under water, Legal aspects, Governmental interrelations, Adjacent land owners, Boundaries(Property), Water law, Water rights, Common law, Riparian lands, Non-navigable waters, Common law, Rivers, Beds.
Identifiers: *Arkansas River(Title to bed).

Suit was brought to quiet title to a designated stretch of the natural bed of the Arkansas river. Plaintiff Choctaw and Chickasaw Nations contended that they owned an undivided interest in the entire bed. Defendant Cherokee Nation, while conceding that plaintiffs owned the south half of the bed, contended that it owned the north half of the bed. At trial the case centered around the interpretation of numerous treaties between the United States and the Indian Nations. One of the major issues was whether the bed of the river was conveyed in grants which used the Arkansas river as a boundary. The court found that when the United States disposes of riparian lands, and no intent to restrict the conveyance to lands ending at the bank is shown, and lands are not within a state, then what the grant conveys is to be determined according to common law principles and Supreme Court decisions. The court then found that the common law and decisional rule is that a grant bounded by a non-navigable stream carries right and title to the center of the stream, absent a clear intention otherwise. Applying this rule to the treaties involved, the court found the defendants to be owner of the north half of the bed. (Hoffman-Florida)
W76-01979

NATURAL RESOURCES DEFENSE COUNCIL, INCORPORATED V CALLAWAY (ACTION TO REQUIRE CORPS OF ENGINEERS TO ISSUE REGULATORY DEFINITION OF 'WATERS OF THE UNITED STATES').
392 F Supp. 685-86 (D. District of Columbia, 1975). 2 p.

Descriptors: *Federal Water Pollution Control Act, *Watercourses(Legal aspects), *Navigable waters, *Administrative decisions, *Judicial decisions, Legislation, Water law, Regulation, Adjudication procedure, Federal jurisdiction, Legal aspects, Classification, United States, Federal government.
Identifiers: Judicial interpretations, Judicial definitions, Territorial seas, FWPCA Amendments of 1972.

Conservation groups brought this action against the Secretary of the Army, the Army Corps of Engineers, and the Environmental Protection Agency, protesting regulations issued defining 'navigable waters' under the Federal Water Pollution Control Act (FWPCA) as those which have been, are, or may be used for interstate or foreign commerce. Plaintiffs contended that defendants acted unlawfully and in derogation of their duties under the FWPCA in giving 'navigable waters' such a narrow definition. The court granted plaintiffs summary judgement, finding that Congress, by defining the term 'navigable waters' for purposes of the FWPCA Amendments to mean 'the waters of the United States, including the territorial seas', asserted federal jurisdiction over the nation's waters to the maximum extent permissible under the commerce clause. Thus, as used in the FWPCA, the term 'navigable waters' is not limited to the traditional tests of navigability. (Hoffman-Florida)
W76-01980

COMMITTEE TO SAVE LAKE MURRAY V. FEDERAL POWER COMM'N (DISCHARGE OF TREATED EFFLUENT INTO LAKE).
515 F 2d, 379-385 (DC Cir 1975), 7 p.

Descriptors: *South Carolina, *Easements, *Administrative agencies, *Public utilities, *Administrative decisions, *Federal power act, Legal review, Jurisdiction, Navigable waters, Permits, Lakes, Public lands, Legal aspects, Environmental effects, Dams, Public rights, Judicial decisions, Littoral.
Identifiers: Environmental impact statement, Navigable capacity, Public hearings, *Lake Murray(SC).

Petitioners, owners of a residence adjacent to a lake, sought review of an order of the Federal Power Commission approving the application of a public utility for an easement to allow a private developer to lay pipe along a lake bottom for the discharge of treated effluent. The Commission had jurisdiction over the lake since it was created by a dam on a river which has a future navigable capacity. The issues presented at trial were (1) whether the Commission acted within its statutory authority in granting the order, (2) whether the order was based upon substantial evidence, (3) whether an easement can be granted to a private developer; and (4) whether or not a public hearing should have been held prior to granting the easement. The court upheld the Commission's order, finding that the Commission had acted within its statutory authority as granted by Section 4 (e) of the Federal Power Act, and that the easement could be granted to a private developer since it would not shift the use of the lake from public to private use. The court held that public hearings were unnecessary and that the environmental impact statement prepared supported the Commission's decision. (Hoffman-Florida)
W76-01981

UNITED STATES V. SUNSET COVE (FILL MATERIAL DEPOSITED ON MIGRATORY SANDSPIT).
514 F 2d, 1089-1090 (9th Cir 1975), 2 p.

Descriptors: *Sandspits, *Land forming, *Riprap, *Bank stabilization, *Judicial decisions, Shoals, Sandbars, *Shallow water, Erosion control, Stream stabilization, Structures, Coasts, Legal review, Watercourse(Legal aspects), Permits, Environmental effects, *Oregon, United States.
Identifiers: *Sandspit stabilization.

Defendant developer had sought to stabilize a sandspit against further erosion and seasonal movement by the emplacement of a riprap and by filling and elevating the surface to create building sites. The lower court ordered removal of the riprap, since it had been placed there without permit, and defendent appealed. The court of Appeals found that, because of the seaonal movement of the channel and the migratory nature of the shoals and sandbars within the area of its confluence with the sea, the sandspit has a natural tendency to expand and retract up and down the coast. Thus, the defendants attempts at stabilizing the sandspit would have effected permanent changes in the river channel and its course. Such changes are staturtorily prohibited without an Army Corps of Engineers permit. As a result of these findings the lower court decision was affirmed. The relief granted was modified, however, so that the defendant was required to remove only as much of the riprap as would permit nature, in a reasonable period of time, to take its course and reestablish former topographic conditions. (Hoffman-Florida)
W76-01982

UNITED STATES V. ALASKA (STATUS OF AND TITLE TO COOK INLET).
95 S CT 2240-2253 (1975), 14 p.

Descriptors: *Alaska, *Bays, *Inlets, *Federal-State Water Rights Conflicts, *Judicial decisions, Legal review, Leases, Oil, Ownership of beds, Beds under water, Legal aspects, Governmental interrelations, Water law, Beds, State governments, Boundary disputes, History.
Identifiers: Historic bays, Gas and Oil leases, Sovereignty, *Cook Inlet(Alas).

The United States, contending that the lower inlet to Cook Inlet constituted high seas, brought suit against the State of Alaska to quiet title and to enjoin Alaska from offering oil and gas leases for sale in the area. The decision in favor of Alaska was affirmed by the District Court, whereupon this appeal was made to the Supreme Court. The central issue was whether or not Cook Inlet is an historic bay. If it is an historic bay, then the State has sovereignty over the subsurface lands; if it is not, then the United States has paramount rights. To establish historic bay status the claiming nation must have exercised continuous authority over the area, and foreign states must have acquiesced in the exercise of the authority. In reviewing the Court of Appeals decision, the Court divided its findings on the exercise of authority over the Inlet into three time periods; that of Russian sovereignty, that of the United States sovereignity, and that of Alaskan statehood. After reviewing the evidence, the Supreme Court reversed, finding that the evidence offered by the State was not sufficient to establish historic title. (Hoffman-Florida)
W76-01983

UNITED STATES V. INDEPENDENT BULK TRANSPORT (OIL SPILL DAMAGES),
934 F Supp 1319-1324 (SD NY 1975), 6 p.

Descriptors: Federal Water Pollution Control Act, *Judicial decisions, *Water pollution control, *Oil pollution, *Oil spills, United States, Governments, Water pollution, Water law, Legal aspects, Administrative agencies, Oil, Water pollution sources, Penalties(Legal), Legislation, Administrative decisions, Federal government.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Evidence, Due process, Administrative law, Procedural law.

Plaintiff United States sued defendant barge owner to recovery civil penalties administratively adjudged by the Coast Guard pursuant to the

Federal Water Pollution Control Act Amendments of 1972, and imposed as a result of oil spills. During pretrial discovery the government disclosed that the official Coast Guard record of the case contained several items not previously shown or described to defendant. These undisclosed matters led to a claim by defendant that it had been denied its statutory right to 'notice and opportunity for a hearing'. The District Court agreed, holding that at the hearing and upon administrative appeal the defendant had a fundamental right to confront factual matters and contentions that were, or might be deemed adverse to its position. Defendant should also have been afforded an opportunity to be heard in rebuttal. The court further ruled that the procedural deficiencies could not be cured by a de novo hearing before the court itself, since the ultimate decision was one for administrative discretion. (Schilling-Florida)
W76-01984

PUBLIX SUPER MARKETS, INC V PEARSON (FILLING OF WATER FILLED PHOSPHATE PITS).
315 So 2d, 98-101, (2d DCA Fla 1975), 4 p.

Descriptors: *Florida, *Riparian rights, *Nonnavigable waters, *Artificial lakes, *Land reclamation, Water Water law, Legal aspects, Common law, Lakes, Lake beds, Lake shores, Riparian land, Water rights, Artificial watercourses, Riparian waters, Landfills, Judicial decisions, Ownership of beds, Real property, Phosphates.
Identifiers: *Phosphate pits, Injunctive relief.

Plaintiffs, the owners of homes bordering on water - filled phosphate pits, brought suit to prohibit defendant, corporate owner of a portion of such pits, from reclaiming and filling those pits located on its land. Finding that defendant's proposed actions would significantly impair the use and enjoyment of the entire surface water of the phosphate pits the trial court granted a temporary injunction. On interlocutory appeal, the District Court of Appeal reversed, holding that the phosphate pits were not subject to the same raparian rights as natural, nonnavigable lakes. The court also ruled that the principle allowing reasonable use of an entire nonnavigable, natural lake by all individuals owning a part of the lake bed does not extend to artificial lakes. Since the phosphate pits were not encircled by a subsivision, and had not been dedicated to recreational use by means of restrictive deeds, plaintiff landowners had no riparian rights such as means of restrictive deeds, plaintiff landowners had riparian rights such as those which accrue on natural, non-navigable lakes. Thus defendant had the right to fill and reclaim those portions of the phosphate pits to which it had legal title. (Schilling-Florida)
W76-01985

FLOOD PREVENTION - CITIES OF 10,000 TO 14,000.
Indiana Ann Stat Sec 48-5063 (supp 1972) 2p.

Descriptors: *Indiana, *Flood control, *Water supply, *Cities, *Classification, Legislation, Flood protection, Public health, Administration. Legal aspects, Flood data, Penalties(Legal), Programs, Floodwater.

Set forth in this statute are laws now applicable for cities that had previously operated under the Flood Control Act of Fifth Class Cities which was repealed in 1965. If no action is taken by the common council on any city with a population between 10,000 to 14,000 than that city shall administer its flood control program pursuant to an act entitled 'An act to prevent floods and protect cities of the second, third, fourth and fifth classes, and incorporated towns, from inundation from flood waters'. The council of any city, however, has the option of administering its program under an act entitled 'An act concerning flood control districts, and declaring an emergency.' (Hoffman-Florida)
W76-01986

WATER CONTROL (REGULATING POLLUTION AND DISCHARGE OF UNTREATED WASTES INTO MISSISSIPPI RIVER).
La Rev Stat secs 56:1431 thru 56:1463 (Supp 1973), 5p.

Descriptors: *Louisiana, *Water pollution control, *Aquatic habitats, *Mississippi River, Water pollution, Legislation, Water quality control, Pollutants, Water quality standards, Water pollution effects, Penalties(Legal), Law enforcement.
Identifiers: Statutory penalties.

Chapter 3, Water Control, establish a Stream Control Commission of Louisiana which is authorized to issue orders and regulations to provide protection for the various water bodies and aquatic life within the state. The Commission is authorized to bring civil actions against any person who negligently or willfully causes pollution of state waters in such concentration as to render the water unfit for maintenance of normal fish or aquatic life characteristics. Chapter 3 also prohibits the knowing discharge of any substance into a state water body which results in pollution. Standards are set up for determining what constitutes water pollution, and provides civil penalties for anyone who transcends them. The chapter specifically prohibits the discharge of any untreated waste into any public body of water in the state. It also provides that any discharged waste shall receive the best practical secondary treatment or its equivalent. Otherwise the offender will be liable for a statutory penalty for each day during which the violation occurred. (Hoffman-Florida)
W76-01987

CITIES SERVICE COMPANY V. STATE OF FLORIDA (ACTION BY STATE FOR DAMAGES AND INJUNCTIVE RELIEF ARISING OUT OF BREAK IN DAM IMPOUNDING PHOSPHATE SLIME).
312 So 2d 799-804 (2d District Court of Appeal of Florida, 1975), 5 p.

Descriptors: *Phosphates, *Florida, *Dam failure, *Fishkill, *Settling basins, Judicial decisions, Legal review, Penalties(Legal), Disasters, Reservoirs, Water pollution sources, Water pollution effects, Water pollution, Land use, Accidents, Water quality control, Rupturing, Damages.
Identifiers: Strict liability.

In 1971 a dam break occurred in one of appellant's settling ponds operated in conjunction with its phosphate mine. As a result, approximately one billion gallons of phosphate slimes contained therein escaped into state waters, killing countless numbers of fish and inflicting other damage. The state subsequently filed suit seeking adjunctive relief as well as compensatory and punitive damages arising out of the dam break. The trial court struck the claim for punitive damages but granted the state's motion for partial summary judgement on liability. The premise of the order was that the defendant was liable without regard to negligence or fault for the damage occurring by reason of the escape of the phosphate wastes into state waters. On appeal, the court affirmed the lower court decision. The Court of Appeal held that the doctrine of strict liability for damage resulting from the nonnatural use of land should apply in Florida and that a phosphate slime reservoir constitutes such a non-natural us of land. (Hoffman-Florida)
W76-01988

FALCO V. JAMES PETER ASSOCIATES, INC. (ACTION BY CONTINGUOUS LANDOWNERS FOR DAMAGES AND INJUNCTIVE RELIEF ARISING OUT OF ALLEGED CHANGE OF NATURAL FLOW OF SURFACE WATER).
335 A 2d, 301-303, (Sup ct Conn 1973), 3 p.

Descriptors: *Connecticut, *Judicial decisions, *Real property, *Damages, *Surface drainage, *Land fill, Retaining walls, Penalties(Legal), Damages, Legal aspects, Land appraisals, Value, Property value, Salvage value, Economic impact, Flow, Repairing, Replacement costs, Surface waters, Surface runoff, Value.
Identifiers: Natural water flow.

Defendant property owners' predecessor in title had erected an apartment complex requiring extensive landfill. This landfill altered the natural flow of water, causing water to flow onto plaintiffs' land instead of away from it. At trial the state referee found defendants had maintained their premises so as to continue damaging plaintiffs' land. He found that a solution to the problem would be the construction of a retaining wall and a French drain; that the cost of the wall and drain would be $9000; and that plaintiffs were entitled to a judgement for the amount plus $100 nominal damages. The measure of damages, the court said, should be the dimunition in value determinable from the cost of repairing damage. Such cost may neither exceed the former value of the land nor enhance the value of the property over what it was before damage occurred. In this case no evidence was shown concerning the prior value of the plaintiffs' land. Furthermore, before damages can be awarded, it must be shown that defendants had been given notice of the condition and had refused to correct it. (Hoffman-Florida)
W76-01989

SOCIETY FOR PROTECTION OF NEW HAMPSHIRE FORESTS V. SITE EVALUATION COMMITTEE (APPEAL BY GROUP OPPOSING LOCATION OF NUCLEAR GENERATING FACILITY ALLEGING ADVERSE AFFECT ON WATER QUALITY).
337 A2d 773-90 (Supreme Court of New Hampshire, 1975), 8 p.

Descriptors: *New Hampshire, *Nuclear power plants, *Sites, *Administrative agencies, *Administrative decisions, Land use, Regulation, State governments, Adjudication procedure, Environmental effects, Thermal pollution, Judicial decisions, Water management(Applied), Water policy, Administration, Permits, Legal aspects.
Identifiers: Administrative findings, Subdelegation(Administrative agencies).

Opponents of a nuclear generating facility appealed from the decision of the site evaluation committee, a state administrative agency, approving the location of a facility in Seabrook, New Hampshire. Two of the issues presented were: whether the committee subdelegated its duty to ascertain the impact on water quality by the proposed facility's dishcarge of cooling water in violation of a state statute; and whether the findings of the committee were legally sufficient. The court found that no subdelegation had occurred since the site evaluation committee and the water supply and pollution control commission each fulfilled separate but coordinated functions in the authorization of the Seabrook site. As to the legal sufficiency of the findings, however, the court remanded the case for the purpose of requiring the site evaluation committee to provide basic finding of fact on the existing record to support the ultimate conclusions it has reached. The court found that where the need for new sources may adversely affect the environment, the determination of whether administrative findings are sufficient entails weighing the competing value of administrative efficiency against the need for deliberate and considered decision making. In this case, considered decision making was found to require the production of basic findings of fact. (Hoffman-Florida)
W76-01990

ULLIAN V. CULLEN (APPEAL FROM DECISION RESTRAINING OBSTRUCTION OF A WATERCOURSE CARRYING FLOW OF SUR-

FACE WATER FROM ADJOINING PROPERTY).
325 NE2d 593-97, (Appeal Court of Massachusetts, 1975), 5 p.

Descriptors: *Watercourses(Legal aspects), *Surface drainage, *Surface runoff, *Massachusetts, *Natural streams, Culverts, Judicial decisions, Legal review, Landfills, Penalties(Legal), Floods, Developed waters, Outlet works, Conveyance structures, Adjacent land owners, Easements, Artificial watercourses, Rainfall-runoff relationships.

Defendants, during a landfill operation, blocked a culvert opening located on their property. Following the blockage of the culvert, water backed up from the area near the culvert and flooded parts of plaintiff's property. At trial, a master found that the culvert had constituted a well-defined watercourse. The trial judge confirmed the master's report and entered a decree ordering defendants to unblock and reconstruct the alleged watercourse and to grant plaintiff an easement to maintain the watercourse as reconstructed. On appeal, the Appeals Court found that the master's report contained no finding as to the source of the alleged waterflow other than the drainage of surface water from adjoining property. For a culvert to be a natural watercourse it must appear that to be something more than an artificial ditch for carrying off surface water and draining the land through which it passes. The court found no such evidence in the master's report. Thus the decree was reversed, and the case remanded. (Hoffman-Florida)
W76-01991

MARINE POLLUTION-PREVENTION-WASTES, ETC.
PL 93-254; 88 stat 50, US Code Cong and Admin News, p 49-50, 1974, 2 p.

Descriptors: *Transportation, *Oceans, *Waste disposal, *Water pollution sources, *Ships, Water pollution, Legislation, Water pollution control, Pollutants, Water quality control, Abatement, Solid wastes, Ultimate disposal, Wastes, United States, Foreign countries, Navigation.
Identifiers: *Territorial sea.

This Act amends the Marine Protection, Research, and Sanctuaries Act of 1972, in order to implement the provisions of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. These amendments provide that the purpose of the 1972 Act is to regulate: (1) the transportation by any person of material from the United States and, in the case of United States vessels, aircraft, or agencies, the transportation of material from a location outside the United States, when in either case the transportation is for the purpose of dumping the material into ocean water; and (2) the dumping of materials transported by any persom from a location outside the United States, if the dumping occurs in the territorial sea or the contiguous zone of the United States. Also presented are various other technical amendments to the 1972 Act. (Hoffman-Florida)
W76-01992

BURGESS MINING AND CONSTRUCTION CORPORATION V. STATE EX REL BAXLEY (ACTION BY STATE FOR DAMAGES RESULTING FROM MINING COMPANY'S ALLEGED POLLUTING OF RIVER).
312 So 2d 842-48 (Civil Appeals of Alabama, 1975), 7 p.

Descriptors: *Alabama, *Mine wastes, *Water quality standards, *Judicial decisions, *Permits, Legal aspects, State jurisdiction, Administrative agencies, Regulation, Water pollution sources, Industrial wastes, Environmental effects, Aquatic life, Penalties(Legal), Waste water treatment, Rivers, Recreation.

The State brought an action to recovery civil penalties from defendant mining company which was allegedly polluting a river without first obtaining a permit. From a judgement in favor of the State, the defendant appealed. Defendant contended that there was insufficient evidence of the pollution charge to sustain the verdict, since there was no showing that the defendant violated any standard established by the Alabama Water Improvement Commission. The court rejected this contention, noting that the complaint against defendant was not for a violation of water quality standards but for the pollution of the river without a permit. The court ruled that defendant had discharged matter into the river without a permit and that such material was pollution as defined by Alabama Water Improvement Act, and was harmful to aquatic life and detrimental to the recreational use of the river. Thus, it was not necessary for the State to introduce proof showing violations of water quality standards set by the Commission. The court noted, however, that evidence offered to show compliance with established criteria of water standards would have been a defense to the charge of pollution. (Hoffman-Florida)
W76-01993

WARNER V. REPLINGER ('BAY' DEFINITION).
397 F Supp 350-60 (DRI 1975), 11 p.

Descriptors: *Northeast U.S., *Bays, *State jurisdiction, *Federal jurisdication, *International waters, Legal aspects, Legal review, Inlets(Waterways), Federal-state water rights, Conflicts, Navigable waters, Administrative agencies, Water rights, Coasts, Ajudication procedure, Judicial decisions, Federal government, State governments.
Identifiers: Administrative regulations, Coastal waters, Licenses, Standing(Legal).

Plaintiffs, Connecticut pilots, sought declaratory and injunctive relief challenging a Rhode Island statute requiring pilots in Block Island Sound to have Rhode Island licenses. Plaintiffs contended that the Congressional test for a 'bay', in which the area of the bay is compared to the area covered by a semi-circle whose diameter is equal to the entrance points to the bay, established that Block Island Sound did not constitute a bay and therefore should not be regulated by the Rhode Island statute. Plaintiffs further contended that ship routes in the Sound lay more than three miles off shore, and thus beyond state authority. In denying the plaintiffs their requested relief, the District Court noted that there is no question of the federal government's control over navigable waters and that by statute the federal government has delegated regulations of certain navigable waters to the states. The Court also held that Block Island Sound is a 'bay' within the federal statutes granting states authority to regulate pilots in bays. (Gray-Florida)
W76-01994

NATURAL RESOURCES DEFENSE COUNCIL, INC. V. TRAIN (FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS).
396 F Supp 1386-93 (District of Columbia 1975), 8 p.

Descriptors: *Federal Water Pollution Control Act, *Comprehensive planning, *Governmental interrelations, *Water quality control, *Water pollution sources, Nonstructural alternatives, State jurisdiction, Administrative decisions, Administrative agencies, Management, Administration, Water law, Legal aspects, Jurisdiction, Judicial decisions, Coordination, Legal review.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Point sources of pollution, Non-point sources of pollution.

Plaintiff environmental groups brought suit against the Administrator of the Environmental Protection Agency (EPA) seeking declaratory and injunctive relief concerning the interpretation of various provisions of the Federal Water Pollution Control Act Amendments of 1972. Under applicable provisions of the Act, several governmental units have the authority to designate areas within a state which have substantial water quality control problems. The major issue concerned what role the state governments were to play in planning water quality control programs in non-designated areas. Plaintiffs contended that the states' duties were the same in both designated and non-designated areas; that is, to develop a plan to control point and non-point sources of pollgtion. Furthermore, strict time limitations for compliance with the Act would be applicable to the states. Intervening defendant forest products company, however, contended that the Act merely required the states to engage in general, discretionary planning, thus exempting them from certain time limitation requirements. After trial on the merits, the district court found that the Act requires the states to develop comprehensive planning for both designated and non-designated areas alike. Thus, the court found certain EPA regulations pertaining to non-designated areas to be invalid, and ordered the agency to promulgate new regulations consistent with the opinion. (Hoffman-Florida)
W76-01995

UNITED STATES V. SEA GATE, INCORPORATED (BINDING EASEMENT IN FAVOR OF GOVERNMENT IN THE USE OF LAND ADJOINING ATLANTIC INTERCOASTAL WATERWAY).
397 F Supp 1351-61 (D North Carolina, 1975), 11 p, 1 map.

Descriptors: *Easements, *Land use, *Construction, *Land development, *Dredging, Land tenure, Reasonable use, Competing uses, Land management, Land, Channels, Canal embankments, Judicial decisions, Legal aspects, Non-structural alternatives, United States, Federal government, Real property.
Identifiers: *Atlantic Intercoastal Waterway, Laches, Set-back restrictions.

Plaintiff United States had obtained an easement in 1957 giving it the right to use lands adjoining the Atlantic Intercoastal Waterway for purposes consistent with the operation and maintanance of the Waterway. This action was brought in 1974 to enjoin the defendant developer from constructing residential subdivisions on both banks of the Waterway. After reviewing the evidence, the court found that the easement was binding on the defendants, since the easement had been duly recorded, and since the defendants had full knowledge of the easement before they brought the land. The court also found that the government was not estoppel from maintaining the action, as the defendants had contended, even though it had not prevented construction on other easement lands along the Waterway. In so holding the court relied upon a Supreme Court decision that held laches was no defense to a suit by the government to protect a public right. The court held, however, that it would not be unreasonable to allow the construction on the west bank only, provided that prescribed set-back restrictions were followed. The court noted that the enjoining of construction on the east bank would give the government adequate space for dredging and other operations necessary to maximize the utility of the waterway. (Hoffman-Florida)
W76-01996

PECK V. SHARROW (DOWNCREEK OWNER'S PRIMA FACIE RIGHT TO USE TO 1.0 CUBIC FOOT OF WATER PER SECOND).
531 P2d 1157-61 (Idaho 1975), 5 p.

Descriptors: *Idaho, *Water rights, *Water permits, *Relative rights, *Riparian rights, Licenses,

Riparian waters, Water, Water law, Legal aspects, Flow, Flow measurement, Flow rates, Bodies of water, Water supply, Prior appropriation, Priorities, Judicial decisions.
Identifiers: Evidence, Injunctive relief.

Plaintiff downcreek owners brought action to enjoin defendant upcreek from interfering with their rights to use waters from the creek. The trial court found that plaintiffs held two valid water licenses which entitled them to 1.0 cubic foot of water per second. The trial court found further that defendants had a right to use 0.16 cubic feet of water per second. Although defendants established that water had been diverted to their property prior to the time of plaintiffs' water licenses, the trial court found that they failed to establish such a prior use and application as to given them a right prior to plaintiffs'. The Supreme Court of Idaho in affirming ruled that the trial court's findings were supported by substantial and competent evidence. Plaintiffs' water licenses established a prima facie right to use of waters from the creek. The court also held proper the trial court's order requiring defendants to utilize a measuring device to avoid diverting water when the creek flow was less than 1.0 cubic foot. (Schilling-Florida)
W76-01997

KUIPER V. LUNDVALL (DEFINING GROUNDWATER AS NON-TRIBUTARY IN CHARACTER).
529 P2d 1328-33 (Colorado 1975), 6 p.

Descriptors: *Colorado, *Constitutional law, *Water rights, *Groundwater, Groundwater movement, Groundwater resources, Water, Water law, Legal aspects, State governments, Administrative agencies, Surface waters, Surface-groundwater relationships, Water wells, Streams, Tributaries, Judicial review, Judicial decisions.
Identifiers: *Colorado Ground Water Management Act, Injunctive relief.

Plaintiff State Engineer brought suit to enjoin defendant landowner from transporting water from defendant's wells to a portion of his lands other than those designated to be irrigated by the well water. Defendant counterclaimed, seeking injunctive relief and a declaration that the Colorado Ground Water Management Act was unconstitutional. The trial court entered judgement for defendant, ruling that the Act violated articles of the Colorado Constitution governing the water of streams. The Supreme Court of Colorado reversed, holding that since the groundwaters in question would not reach a stream for over a century, they were not part of the surface stream as contemplated by the state Constitution. The court further held that the Act did not violate the Constitution by granting to an administrative agency the power to make an initial determination of water rights, and the power to grant or refuse permits to drill wells. (Schilling-Florida)
W76-01998

COMMONWEALTH, DEPARTMENT OF HIGHWAYS V. JENT (NO LOSS OF REASONABLE ACCESS TO HIGHWAY BECAUSE OF CHANGE IN SURFACE WATER DRAINAGE).
525 SW2d 121-123 (Ky Ct App 1975), 3 p.

Descriptors: *Kentucky, *Highway effects, *Drainage effects, *Surface waters, *Groundwater, Groundwater movement, Drainage, Drainage area, Construction, Ditches, Access routes, Properties, Property values, Right-of-way, Legal aspects, Legal review, Drainage patterns(Geologic), Damages, Judicial decisions.
Identifiers: Nuisance, Proximate causation, Highway access.

Plaintiff landowners brought an inverse condemnation proceeding claiming that construction of connector roads by defendant, Department of Highways, had altered surface water drainage on their property and deprived them of reasonable access to the highway. Plaintiffs also contended their properties had been directly damaged by water flow, deminishing its value. In reversing a trial court decision for plaintiffs, the Court of Appeals of Kentucky noted that property owners who allege a decrease in property value due to construction-caused water flow must offer proof of the resulting damages, even if it is conceded that negligent construction caused the water flow. Furthermore, the lack of access to highways on infrequent occasions does not constitute a loss of reasonable access. (Gray-Florida)
W76-01999

WERNBERG V. STATE (COMPENSATION FOR OBSTRUCTION OF RIPARIAN PROPRIETOR'S ACCESS TO INLET).
519 P2d 801-804 (Alaska, 1974), 4 p.

Descriptors: *Alaska, *Access routes, *Judicial decisions, *Riparian rights, *Condemnation, Streams, Inlets, Navigable waters, Water rights, State jurisdiction, Constitutional law, Regulation, Legal review, Legal aspects, Riparian land, Littoral.
Identifiers: *Littoral rights.

Plaintiff landowner had sought damages from the state in an inverse condemnation suit for the obstruction of a riparian proprietor's access from a creek to an inlet. After the trial court dismissed the complant, plaintiff appealed to the Alaska Supreme Court. In reversing, the court rejected the state's argument that there was no private littoral right to use public waters for navigation. The Court also rejected an argument that the right to limit littoral access, given to the state by the Alaska Constitution, constituted regulation. After this decision, the state filed a petition for rehearing, contending that the Court had misinterpreted the state's second argument. In denying the rehearing, the Court held that it had not misinterpreted the argument, since it agreed that the state had the right to limit a private littoral right of access. However, the Court also found that the limiting of the access was a taking, and not regulation. Thus, the award of damages was justified. (Hoffman-Florida)
W76-02000

6F. Nonstructural Alternatives

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING BENEFITS OF PROTECTING URBAN FLOOD PLAINS,
Washington Univ., St. Louis, Mo., Inst. for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W76-01595

CONVENTIONAL WISDOM PLUS A NEW PHILOSOPHY--CORPS OF ENGINEERS WATER RESOURCE PLANNING,
For primary bibliographic entry see Field 6E.
W76-01598

FLOOD MANAGEMENT DECISIONMAKING IN THE CONNECTICUT RIVER BASIN: ANALYSIS OF THE EXISTING LEGAL, FINANCIAL AND INSTITUTIONAL FRAMEWORK FOR FLOOD PLAIN MANAGEMENT,
Meta Systems, Inc., Cambridge, Mass.
D. Smith, and S. Robinson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB238-998, $5.00 in paper copy, $2.25 in microfiche. Prepared for New England River Basins Commission, Boston, Mass. 303 p, 7 fig, 3 tab, 15 ref. CRSS-NERBC 1.3F, 1.5F, 1.6F. NERBC 1.3F, 1.5F, 1.6F.

Descriptors: Water resources, *Connecticut River, *Flood control, *Non-structural alternatives, *Water management(Applied), *Governments, *Governmental interrelations, *Decision making, Flood protection, Water policy, Wetlands, Vermont, New Hampshire, Connecticut, Massachusetts, *Connecticut River.
Identifiers: Flood management, St. Johnsbury(Vermont), Keene(New Hampshire), Northampton(Mass), Flood plain management, Flood management institutions, Flood management laws, Flood management financing, Inland Wetlands Act, Open planning.

Observations of the existing financial, legal, and institutional mechanisms for flood management decisionmaking in the Connecticut River Basin as well as discussion of interest groups' influence on and interaction with these mechanisms are presented. A set of uniform legal, financial and institutional criteria for evaluating alternative flood management processes is proposed. The flood management decisionmaking structure and process for each state in the Basin, Massachusetts, Vermot, Connecticut, and New Hampshire, is discussed in relation to the state's legislative process and statutory foundation. Section 2 contained 3 case studies which examine the interest groups, local and regional agencies, geographical and historical characteristics, and political controversies unique to each community. The current role of the federal government in regional flood management is also discussed. To incorporate the range of interests into the analysis of flood management alternatives, some formal methodologies are surveyed. Some conclusions are: (1) Flood management is not an important factor in municipal decisionmaking at present in the Connecticut Basin. (2) Communications between local groups who often have a vast store of valuable knowledge and state and federal agencies are inadequate. (3) Biases of state and federal agencies and financial restraints interfere with rational planning. (Salzman-North Carolina)
W76-01599

PERFORMANCE CONTROLS FOR SENSITIVE LANDS: A PRACTICAL GUIDE FOR LOCAL ADMINISTRATORS,
American Society of Planning Officials, Chicago, Ill.
C. Thurow, W. Toner, and D. Erley.
Environmental Protection Agency, Report EPA-600/5-75-005, March 1975. 523 p, 25 fig. 1HA098; 21 AKL 25. R802443.

Descriptors: *Land use, Control, Data collections, Environment, Water resources, *Planning, Analytical techniques, *Performance, Administration.
Identifiers: *Planning controls.

This report is to be used as a handbook by local planning officials in planning for and regulating the use of five distinct natural areas: streams and creeks, wetlands, woodlands, hillsides, and groundwater and aquifer recharge areas. Each section is devoted to the discussion of local regulation of land use in areas identified as 'sensitive'; and each area is discussed in terms of its ecology and value to the public, current regulatory practices, and recommended programs for regulating the area. Also included are appendices showing where and how to go about getting technical assistance from existing governmental agencies and examples of local ordinances for protecting the environmentally sensitive areas. The final section is a monograph on environmental performance standards, the result of a preliminary study on the feasibility of extending the performance standard concept used in industry to regulation of the environment. Its purpose is to explore this possibility and to suggest new areas for research. (EPA)
W76-01871

6G. Ecologic Impact Of Water Development

AMES RESERVOIR ENVIRONMENTAL STUDY, SUMMARY REPORT.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 4A.
W76-01522

WASHINGTON'S WATERFRONT LESSON,
North Carolina Univ. at Chapel Hill. Dept. of Fine Arts.
For primary bibliographic entry see Field 6B.
W76-01596

MANAGING THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C.
R. M. Laska, and J. Gerba.
Available from the National Technical Information Service, Springfield, Va 22161, as PB238-062, $10.75 in paper copy, $2.25 in microfiche. November, 1973, 386 p, 31 fig, 17 tab. EPA-600/5-73-010.

Descriptors: *Environmental control, *Legal aspects, *Political aspects, *Planning, *Governmental interactions, *Comprehensive planning, *Social aspects, Pollution, Administration, Decision-making, Ecosystems, Data.
Identifiers: Environmental management, Environmental standards, Environmental impact statements, Ecology, Residuals, Federal environmental functions, Citizen control, Environmental Protection Agency(EPA).

For environmental policies to be effective, environmental management has to integrate knowledge from a variety of fields and disciplines including government, industry, business, economics, ecology and the general public. Contained in this report are 42 articles covering the full range of environmental management issues. These papers examine the environmental issues from varied perspectives and discuss techniques for citizen participation, management information systems, organizational structures, special regulatory procedures and controls, legal actions and other strategies for improving the environment. Several strategies explored include land use planning, environmental impact statements, and environmental standards and laws. One section examines intergovernmental relations in managing the environment. Three conclusions are reached: the shortcomings of present environmental management techniques are recognized by decision-makers at all levels of authority, sophisticated environmental concepts are found to be non-operational by the local managers, and successful management techniques are not exchanged by communities. For more effective environmental management, more emphasis should be placed on human aspects, managerial and technical assistance must be provided to implement environmental mandates at local level, and sophisticated tools already created must be molded into a more easily transferable form in order to be effective. (Salzman-North Carolina)
W76-01597

ENERGY--ENVIRONMENT.
Ballinger Publishing Co., Cambridge, Mass.
For primary bibliographic entry see Field 6B.
W76-01620

POSSIBLE IMPACTS OF OIL SHALE DEVELOPMENT ON LAND RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5C.
W76-01691

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART I, EFFECT OF THE 'REVIEW AND COMMENT PROCESS' ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01800

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01801

THE WILLAMETTE RIVER GREENWAY: CULTURAL AND ENVIRONMENTAL INTERPLAY,
Oregon State Univ., Corvallis. Dept. of Anthropology.
W. D. Honey, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 554, $6.00 in paper copy, $2.25 in microfiche. Oregon Water Resources Research Institute, Corvallis, Report WRRI-35, September 1975. 133 p, 18 fig, 31 tab, 88 ref, 2 append. OWRT B-023-ORE(5).

Descriptors: *Water quality, *Oregon, Ecology, Environmental effects, *River basin development, Technology.
Identifiers: *Cultural-ecological systems, Industrial-urban technology, *Willamette River Greenway(Ore).

The Willamette River Basin, Oregon, viewed in terms of a cultural-ecological systems, has been subject to three phases of cultural development: hunting and gathering, agrarian, and industrial-urban. Each population base has employed a technology to exploit the environment to the extent that its patterns of culture would allow. This technology has been oriented towards one relevant resource within the ecological system--the Willamette River. The environmental quality of the Willamette River began to show signs of impairment with the onset of the industrial-urban development, and the use of a more sophisticated technology. Only through the efforts of a few concerned citizens did the quality of the water begin to improve by the mid-Twentieth Century. The Willamette River Greenway as a governmental response to renew the relevant resource of the cultural-ecological system. Public attitudes toward the Greenway indicate that basin residents feel industrial-urban technology should be utilized to renew the Willamette River, allowing it to once again become the cultural focal point of the ecological system.
W76-01805

ACTIVITIES AND NEEDS RELATED TO RADIOACTIVITY STANDARDS FOR ENVIRONMENTAL MEASUREMENTS.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W76-01861

IN MEMORIAM: RAINBOW BRIDGE NATIONAL MONUMENT,
F. Hannay.
Ecology Law Quarterly, Vol 4, No 2, p 385-414, 1974. 29 p, 130 ref.

Descriptors: *Judicial decision, *National monuments, *National parks, *Dams, *Reservoirs, Erosion, Preservation, High water mark, Arizona, Utah, Sulfur, Powerplants, Arid lands, Structural stability, Structures, Legal aspects, Water resources development, Water level fluctuation, Desert plants, Deserts, Water storage, Arid climates.
Identifiers: *Rainbow Bridge National Monument, *Colorado River Storage Project Act, *Glen Cayon/Lake Powell Project, Congressional Acts, Bathtub ring(Reservoirs).

The nature and possibly the very existence of Rainbow Bridge National Monument has been affected by the decision of the Tenth Circuit in Friends of the Earth v. Armstrong. The decision allows the waters dammed by the Glen Canyon/Lake Powell Project to invade the monument's natural arid environment, despite the 1956 Colorado River Storage Project which specifies that no dams or reservoirs will be constructed within any national park or monument. The court gave as a reason for its ruling that the provisions of the Act had been overruled by implication and need no longer be adhered to. The author argues that the intent of Congress should be determined by Congressional action and not by judicial interpretation, especially where the decision will set a precedent for future judicially sanctioned encroachments on the National Parks and Monuments creasted by Congress. (Parrish-Florida)
W76-01953

THE FUTURE OF ENVIRONMENTAL DEFENSE,
Environmental Law Inst., Washington, D.C.
F. R. Anderson, and A. Rosencranz.
American Bar Association Journal, Vol 61, p 316-320, March 1975. 5 p.

Descriptors: *Environmental control, *Legal aspects, *Comprehensive planning, *Regulation, *Future planning(Projected), Projections, Adoption of practices, Construction, Federal Water Pollution Control Act, Legal review, Legislation, Pollution abatement, Judicial decision, Administrative agencies, Long-term planning, Environmental engineering.
Identifiers: *Environmental litigation, *Alaska Pipeline, *Energy policies.

Environmentalists are starting to re-evaluate the role of lawsuits in environmental defense. While such litigation has been primarily responsible for redesigning, delaying, and stopping numerous projects, the success or failure of legal challenges has too often depended on technicalities, rather than on the merits of the activities challenged. Thus there is a recognized need for implementation of comprehensive land use and energy policies. In the absence of such policies, environmental lawyers must employ non-litigative strategies, such as conferring with administrative officials, reviewing and commenting on proposed environmental regulations, and marshalling public opinion at state and local levels. These lawyers generally keep away from the legislative process, since most environmental groups have tax-exempt status under the Internal Revenue Code. The problem with these nonlitigative areas is that lawyers are accustomed to working on a case by case basis, and often do not collaborate enough to prevent duplication of effort, much less to build a coalition and establish a joint strategy. Even so, various methods and techniques are already available or being developed to aid environmental lawyers desiring broad social change under a defined national strategy. (Hoffman-Florida)
W76-01961

CAN NEW YORK'S WETLANDS BE SAVED. A CONSTITUTIONAL AND COMMON LAW SOLUTION,
For primary bibliographic entry see Field 6E.
W76-01964

CRIMINAL PROSECUTION UNDER THE ALASKA ENVIRONMENTAL CONSERVATION ACT OF 1971: STOCK V STATE,
For primary bibliographic entry see Field 5G.
W76-01967

TOWARD AN INTERNATIONAL STANDARD OF ENVIRONMENT,
Georgetown Univ., Washington, D.C. School of Law.
For primary bibliographic entry see Field 6E.
W76-01970

E L I CONCLUDES WATER ACT ENFORCEMENT STUDY.
For primary bibliographic entry see Field 5G.
W76-01972

SOCIETY FOR PROTECTION OF NEW HAMPSHIRE FORESTS V. SITE EVALUATION COMMITTEE (APPEAL BY GROUP OPPOSING LOCATION OF NUCLEAR GENERATING FACILITY ALLEGING ADVERSE AFFECT ON WATER QUALITY).
For primary bibliographic entry see Field 6E.
W76-01990

7. RESOURCES DATA

7A. Network Design

A REVIEW OF STATISTICAL PROCEDURES USED FOR EXAMINATION OF WATER DATA,
Massachusetts Univ., Amherst. School of Health Sciences.
A. J. Gross.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-104, $3.50 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publications No 58, Completion Report FY-76-6, April 1975, 16 p, 2 ref.

Descriptors: *Water quality, *Bibliographies, *Statistical methods, Data collections, Reviews, *Time series analysis, *Regression analysis, Methodology.

The purpose is to review conventional statistical methods which are currently in use in the analysis of water quality data. The report focuses on 45 articles containing statistical methodology that have been published in the last ten years. In reviewing the articles the method of annotated bibliographies is used in order that readers can ascertain specific research approaches. The journals covered in this review are: Journal of the Water Pollution Control Federation, Water Resources Bulletin, Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Biometrics, and Journal of the American Statistical Association. In addition, selected reports by various water resources research groups throughout the country were covered. Use of time series analysis and regression techniques was predominant.
W76-01509

LONG-TERM STREAMFLOW RECORDS RECONSTRUCTED FROM TREE RINGS,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
For primary bibliographic entry see Field 2B.
W76-01708

7B. Data Acquisition

EVALUATION OF SATELLITE REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS AND COASTAL MARSHLANDS,
National Space Technology Lab. Bay St. Louis, Miss. Earth Resources Lab.
R. H. Cartmill.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-133 44, $6.00 in paper copy, $2.25 in microfiche. ERL Report 128, July 1974. 127 p, 24 fig, 6 tab, 18 ref, 3 append.

Descriptors: *Remote sensing, *Wetlands, *Coastal marshes, *Louisiana, Data processing, Automation, Satellites(Artifical), Aerial photography, Land forming, Vegetation, Aquatic plants, Forests, Water quality, Environment.
Identifiers: *ERTS, Pattern recognition, Species identification.

The evaluation was conducted in a humid swamp and marsh area of southern Louisiana. Earth Resources Technology Satellite (ERTS) digital multispectral scanner data was compared with similar data gathered by intermediate altitude aircraft. Automatic data processing was applied to several data sets to produce simulated color infrared images, analysis of single bands, thematic maps, and surface classifications. These products were used to determine the effectiveness of satellites to monitor accretion of land, locate aquatic plants, determine water characteristics, and identify marsh and forest species. The results showed that to some extent all of these can be done with satellite data. It was most effective for monitoring accretion and least effective in locating aquatic plants. The data sets used showed that the ERTS data is superior in mapping quality and accuracy to the aircraft data. However, for some applications requiring high reaolution or maximum use of intermittent clear weather conditions, data gathering by aircraft is preferable. Data processing costs for equivalent areas were about three times greater for aircraft data than ERTS data, primarily because of the larger volume of data generated by the high resolution aircraft system. (Sims-ISWS)
W76-01531

SATELLITE RELAY AND PROCESSING OF HYDROLOGIC DATA IN SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
E. T. Wimberly.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 784, $3.25 in paper copy, $2.25 in microfiche. Water-Resources Investigations 12-75, 1975. 19 p, 9 fig, 11 ref.

Descriptors: *Remote sensing, *Hydrologic data, *Satellites(Artificial), *Florida, *Data transmission, Rainfall, Water levels, Telemetry, Data collections, Watershed management.
Identifiers: *Real-time data, NASA, LANDSAT, Big Cypress Swamp(Fla), Everglades.

A Data Collection System (DCS), using the LANDSAT Satellite (LANDSAT-1) as a data-relay platform, has been tested in south Florida. The purpose of DCS is to transmit water data to the user in near real time, even from remote areas. The flow of data is from data-collection platforms at field sites via LANDSAT-1 satellite to the National Aeronautics and Space Administration's (NASA) ground-receiving stations to the NASA Data Processing Facility at Goddard Space Flight Center to the Miami office of the U. S. Geological Survey to data users. The process requires only a few hours, and current data are provided to water-management agencies in several different forms. Thousands of square miles of south Florida are inundated many months of the year when the only practical access is by airboat or helicopter. The need for near-real-time data becomes imperative during times of crisis, such as a hurricane, because rapid evaluation of the situation and operational decisions are mandatory. In October 1972 a DCS began transmitting to the U. S. Geological Survey Office in Miami, water-level and rainfall information from gaging stations in the water-conservation areas, Everglades National Park, and Big Cypress Swamp. The time for this transmittal is about 45 minutes. (Woodward-USGS)
W76-01578

GENERAL MODEL TO SIMULATE FLOW IN BRANCHED ESTUARIES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W76-01580

A MODEL OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS FIR FOREST FLOOR,
Minnesota Univ., Minneapolis. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 2I.
W76-01613

LIQUID CHROMATOGRAPHIC ANALYSES IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W76-01636

PAPER CHROMATOGRAPHIC ANALYSIS IN AIR POLLUTION,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W76-01637

PAPER CHROMATOGRAPHIC ANALYSIS IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W76-01638

DETECTION OF SOIL MOISTURE BY REMOTE SURVEILLANCE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-01706

STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY AND TEMPERATURES,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 2K.
W76-01716

A CLOSE-INTERVAL FRACTIONATOR FOR SEDIMENT CORES,
Union Carbide Corp., Tarrytown, N.Y. Environmental Science Program.
For primary bibliographic entry see Field 2J.
W76-01720

SOME ENVIRONMENTAL PROBLEMS AND THEIR SATELLITE MONITORING,
Tel Aviv Univ., (Israel). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W76-01791

WATER QUALITY STUDIES AND LAND-USE MAPPING USING ERTS-1 DATA,
Lund Univ. (Sweden). Dept. of Geography.
For primary bibliographic entry see Field 5A.
W76-01792

REMOTE SENSING OF COAL MINE POLLUTION IN THE UPPER POTOMAC RIVER BASIN.
Ambionics, Inc., Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-01831

WAVE HEIGHT INDICATOR LITERATURE SEARCH AND VENDOR SURVEY,
For primary bibliographic entry see Field 2L.
W76-01834

FEASIBILITY OF REMOTE SENSING FOR DETECTING THERMAL POLLUTION--PART I: FEASIBILITY STUDY; PART II: IMPLEMENTATION PLAN,
Miami Univ. Coral Gables, Fa. Dept. of Mechanical and Industrial Engineering.
For primary bibliographic entry see Field 5A.
W76-01838

REMOTE SENSING APPLICATIONS IN MARINE SCIENCE PROGRAMS AT VIMS,
Virginia Inst. of Marine Science, Gloucester Point.
H. H. Gordon, M. E. Penney, and R. J. Byrne.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-10566, $5.00 in paper copy, $2.25 in microfiche. Report NASA CR-137475, October 1974. 79 p, 29 fig, 5 tab, 25 ref, 2 append. NASA NAS6-1902.

Descriptors: *Remote sensing, *Wetlands, *Thermal pollution, *Virginia, Powerplants, Heated water, Satellites(Artifical), Aircraft, Salt marshes, Coasts, Seashores, Inlets(Waterways), Barrier islands, Tides, Measurement, Instrumentation, Data processing, Estuaries.

During 1973 scientists at the Virginia Institute of Marine Science (VIMS) utilized remote sensing in three programs: tonal variations in imagery of wetlands, use of the thermal infrared to delineate the discharge cooling water at the Virginia Electric and Power Company nuclear power station of the James River, and the use of aerial photography to determine the volume storage function for water in the marsh-bay complex fed by Wachapreague Inlet on the Eastern Shore of Virginia. One program was to determine the causes of tonal variations in wetlands imagery and delimit their scope. Results from a predominately single-species salt marsh show variations in tone large enough to cause confusion in an automatic mapping scheme or bioproductivity studies. Thermal infrared imagery from a scanner was used to obtain an instantaneous surface thermal map of the area. Rectification of the strip film from the scanner, thermal-spatial resolution, and the correlation of the geometrically corrected scanner output with ground recorded information is discussed. Some insights into the plume behavior are presented. (Sims-ISWS)
W76-01839

DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING THERMAL INFRARED IMAGERY,
Alabama Univ., Huntsville. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-01840

BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, Ann Arbor.
F. J. Thomson.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A001-090, $4.00 in paper copy, $2.25 in microfiche. Quarterly Report, October 15, 1974. 28 p, 11 fig, 3 ref. N00014-74-C-2073.

Descriptors: *Remote sensing, *Coasts, *Florida, Beaches, Seashores, Estuaries, Sands, Bottom sediments, Radar, Aircraft, *Mapping, Measurement, Instrumentation, On-site investigations, Strip mine wastes, Coal mines, Data collections, Data processing.

Work on this contract is divided into three tasks: (1) compositional mapping of beaches and river systems, (2) enhancement and location of bottom features with passive multispectral data, and (3) multispectral radar imaging for coastal areas. In Task I, an attempt is being made to build on the capability to discriminate silica sand beaches from other beaches through the use of the restrahlen technique. The specific focus is to obtain estimates of beach sand grain size, beach moisture content, and sorting of beach materials through the use of remote sensing indicators. These parameters are important in assessing trafficability. In Task II, the emphasis is on developing techniques for delineating bottom features, independent of water depth, using passive multispectral data. While the approaches used are similar to those for measuring water depth, further refinement of that proven capability is not a research task under this contract. In Task III, the potential utility of X and L Band synthetic radar as an all-weather beach sensor is being addressed. Because of the relatively less advanced state-of-the-art of interpretation and processing of radar data, this task has so far emphasized the digitization of radar imagery and the preparation of some promising ratio algorithms. (Sims-ISWS)
W76-01842

A FRAZIL ICE CONCENTRATION MEASURING SYSTEM USING A LASER DOPPLER VELOCIMETER,
Bendix Corp., Davenport, Iowa. Instruments and Life Support Div.
For primary bibliographic entry see Field 2C.
W76-01850

A NOTE ON THE MOISTURE DIFFUSIVITY OF SATURATED SWELLING SYSTEMS FROM DESORPTION EXPERIMENTS,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology and Climatology.
For primary bibliographic entry see Field 2G.
W76-01852

DESIGN AND USE OF CLOSED-TOP INFILTROMETERS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2G.
W76-01854

MEASURING SOIL CREEP,
Iowa State Univ., Ames. Dept. of Agronomy.
F. R. Troeh.
Soil Science Society of America Proceedings, Vol 39, No 4, p 707-709, July-August 1975. 4 fig, 2 tab, 5 ref.

Descriptors: *Creep, *Mass wasting, *Soils, *Slope stability, *Solifluction, *Measurement, Instrumentation, Soil density, Slopes, Strain gages, Sites, On-site tests.
Identifiers: *Soil movement, Augers.

Soil creep occurs so slowly that it is usually overlooked. Nevertheless, its persistence makes it significant to sciences that deal with soils or landscapes. Creeping soil can move landmarks and cause structures to tilt or collapse. But, the rate of movement by soil creep under various conditions is largely unknown. A sensor that measures soil creep was described. The sensor was a sheet metal structure buried in a deep auger hole. Movement detectors mounted at four depths on the sensor were coupled to indicators at the soil surface to show how much movement has occurred. Readings from such sensors identify the location, depth, and rate of soil creep. (Visocky-ISWS)
W76-01856

A COMPARISON OF CANADIAN AND UNITED STATES STANDARD METHODS OF MEASURING PRECIPITATION,
Windsor Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W76-01858

RADIATION EQUIPMENT AND THE PRINCIPLES INVOLVED IN ITS USE,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria), Div. of Atomic Energy in Food and Agriculture.
For primary bibliographic entry see Field 2G.
W76-01883

A SUCTION SAMPLER FOR QUANTITATIVELY SAMPLING BENTHOS ON ROCKY SUBSTRATES IN RIVERS,
Icthyological Associates, Inc., Berwick, Pa.
W. F. Gale, and J. D. Thompson.
Transactions of the American Fisheries Society, No 2, p 398-405, 1975. 2 fig, 3 tab, 17 ref.

Descriptors: Technology, *Methodology, *Design, *Sampling, Aquatic organisms, Efficiencies, Benthos, Population.
Identifiers: *Suction sampler, Rocky substrates.

A dome sampler was designed to be used by a scuba diver to sample benthos quantitatively. 82% of the organisms released inside the sampler were recovered during efficiency tests. Ten minutes pumping per sample was required for best results. The sampler was described in detail. (Klein)
W76-01905

A SIMPLE DOSING SYSTEM FOR CONTINUOUS STREAM DOSING,
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
P. J. Eisele.
Transactions of the American Fisheries Society, No 2, p 359-362, 1975. 2 fig, 2 ref.

Descriptors: Technology, *Methodology, *Design, *Flow systems, Water quality, Toxicity, Laboratory tests, Organic compounds, Stream flow, Pesticides.
Identifiers: *Dosing system, *Continuous stream dosing, Methoxychlor.

A simple mechanical dosing apparatus to continuously dose streams with chemicals solutions involved a modified Sutro weir and a simple lever-float system. This dosing device was easily constructed, inexpensive, and quite reliable under conditions of minor flow variation (a seasonal fluctuation of one order of magnitude or less). It maintained an average stream concentration variation of only plus or minus 10 percent during a year of low level pesticide dosing. (Klein)
W76-01908

A COMPARISON OF FOUR SAMPLERS FOR BENTHIC MACROINVERTEBRATES INHABITING COARSE RIVER DEPOSITS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
B. D. Hughes.
Water Research, Vol 9, No 1, p 61-69, January 1975. 5 tab, 36 ref.

Descriptors: *Benthic fauna, *Invertebrates, *Sampling, Electric shocking gear, Nets, Analytical techniques, Bottom sampling, On-site data collections, Benthos, Methodology, Biological communities, Electrical equipment, Technology.
Identifiers: *Artificial substrate samples, *Surber sampler, *Box samplers, Wales.

Four methods of taking quantitative samples of benthic invertebrates were compared at two sites on a river in South Wales. Substantial differences were found in the qualitative and quantitative composition of the catches. Explanations for these differences are presented. Two of the samplers had nets, one utilized electric shock and one was a tray 'artificial' substrate. (Katz)
W76-01909

A SALINITY CONTROLLER FOR FLOW-THROUGH BIOASSAYS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W76-01929

7C. Evaluation, Processing and Publication

IMPLEMENTATION OF A N. P. D. E. S. DATA MANAGEMENT SYSTEM,
Krannert School of Industrial Management. Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01502

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert School of Industrial Administration. Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01508

A REVIEW OF STATISTICAL PROCEDURES USED FOR EXAMINATION OF WATER DATA,
Massachusetts Univ., Amherst. School of Health Sciences.
For primary bibliographic entry see Field 7A.
W76-01509

AN INFORMATION RETRIEVAL SYSTEM FOR THE MACROINVERTEBRATE FAUNA OF INDIANA RIVERS AND LAKES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2I.
W76-01513

THREE-DIMENSIONAL SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-01518

HYDROGEOLOGY OF GLACIAL DEPOSITS IN TIPPECANOE COUNTY, INDIANA, SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING WATER RESOURCES IN MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W76-01521

READING USAC PROJECT: SEWER AND WATER ACCOUNTS PROCESSING COMPUTER PROGRAM, RELEASE NUMBER ONE, SOFTWARE,
Reading, Pa. USAC Project.
For primary bibliographic entry see Field 5G.
W76-01527

HYDROLOGIC UNIT MAP--1974, STATE OF WISCONSIN.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22902, Price $1.25. Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Wisconsin, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Wic), *Hydrologic boundaries, Subregions, Accounting units, Catologing units.

This map and accompanying table show Hydrologic Units in Wisconsin that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information of Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodward-USGS)
W76-01571

HYDROLOGIC UNIT MAP--1974, STATE OF HAWAII.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.25. Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Hawaii, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Hawaii), *Hydrologic boundaries, Subregions, Accounting units, Catologing units.

This map and accompanying table show Hydrologic Units in Hawaii that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodward-USGS)
W76-01572

HYDROLOGIC UNIT MAP--1974, STATE OF GEORGIA.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.00. Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Georgia, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit map(Ga), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Georgia that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resource Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodward-USGS)
W76-01573

HYDROLOGIC UNIT MAP--1974, STATE OF ILLINOIS.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.00. Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Illinois, Water resources, Data collections, Planning, hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologlic unit maps(Ill), *Hydrologic boundaries, Subregions, Accounting units, Catologing units.

This map and accompanying table show Hydrologic Units in Illinois that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodward-USGS)
W76-01574

SATELLITE RELAY AND PROCESSING OF HYDROLOGIC DATA IN SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7B.
W76-01578

LAKES OF OREGON: VOLUME 3. HOOD RIVER, MULTNOMAH, WASHINGTON, AND YAMHILL COUNTIES,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2H.
W76-01579

MAP SHOWING FLOOD OF APRIL 1975 AT MERIDIAN TOWNSHIP, MICHIGAN,
Geological Survey, Lansing, Mich.
R. L. Knutilla, and L. A. Swallow.
Open-file map, 1975. 2 sheets, 7 fig, 2 tab.

Descriptors: *Floods, *Maps, *Flood data, *Michigan, *Streamflow, Flow measurement, Discharge(Water), Flood damage, Aerial photography, Hydrographs, Flood peak, Peak discharge, Snowmelt, Rainfall, Flood frequency, Hydrologic data.
Identifiers: *Meridian Township(Mich), *Red Cedar River(Mich).

On April 18, 1975 between 5 p.m. and 12 p.m. Meridian Township, Michigan, experienced an intense rain storm that caused the Red Cedar River to overflow its banks resulting in extensive flooding. Damages may be as high as 6.25 million dollars. The drainage area of the Red Cedar River at the east boundary of the report area (Meridian Road) is about 315 square miles. At the west boundary (Hagadorn Road) the drainage area is about 355 square miles. Two weeks prior to the storm, about 13 inches of snow fell over most of the Red Cedar River basin. Subsequent melting caused increased streamflow. The extent of flooding along the Red Cedar River and Pine Lake Outlet is shown on the photomosaic base maps. Discharge data obtained at East Lansing are equivalent to those at the western boundary of Meridian Township. Discharge is about 10 percent lower at the eastern boundary. The discharge hydrograph for East Lansing shows the peak discharge of 5,940 cfs which occurred near midnight on April 20. This discharge is equivalent to a runoff of about 17 cfs per square mile of drainage area. The flood had a recurrence interval of about 40 years or about a 2.5 percent chance of occurrence in any year. (Woodard-USGS)
W76-01584

GEOLOGIC CONTROL OF SUPPLY AND QUALITY OF WATER IN THE MOUNTAINOUS PART OF JEFFERSON COUNTY, COLORADO,
Geological Survey, Denver, Colo.
W. E. Hofstra, and D. C. Hall.
Available from Colorado Geological Survey, Dept. of Natural Resources, Denver Colo., Price $3.00. Colorado Department of Natural Resources, Denver, Bulletin 36, 1975. 51 p, 42 fig, 8 tab, 54 ref.

Descriptors: *Basic data collections, *Hydrologic data, *Colorado, Surface waters, Groundwater, Water quality, Streamflow, Water wells, Aquifer characteristics.
Identifiers: *Jefferson County(Colo).

Information is presented on the availability of water for domestic supply in the mountainous area in Jefferson County, Colo. The area covered by the study is roughly 300 square miles of mountainous Jefferson County extending from Clear Creek on the north to the Pike National Forest boundary on the south and from the east edge of the Front Range mountains to the western boundary of the county. The population of the mountainous part of the county was roughly 20,000 in 1974. Hydrologic data were collected at 34 streamflow sites. Bacteriological and chemical analyses of surface waters are given for 32 sites. During the study, 31 springs and 727 wells were sampled. Comprehensive bacteriological and chemical analyses of samples collected from 38 wells and 1 spring are given. Eleven test wells drilled by air-percussion. Geologic logs and hydrologic test data for wells are given. (Woodard-USGS)
W76-01585

HISTORY OF IRRIGATION AND CHARACTERISTICS OF STREAMFLOW IN NORTHERN NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4A.
W76-01589

GROUND WATER IN SELECTED AREAS IN THE KLAMATH BASIN, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2F.
W76-01590

INVENTORY AND CATALOGING OF SPORT FISH AND SPORT FISH WATERS IN SOUTHEAST ALASKA,
Alaska Dept. of Fish and Game, Juneau.
A. Schmidt, and F. S. Robards.
Alaska Division of Sport Fish, Vol 16, Study G-I-A, July 1, 1974-June 30, 1975. 113 p, 31 fig, 49 tab. 59 ref.

Descriptors: *Census, *Fish populations, *Sport fish, *Alaska, *Lake fisheries, Chemical properties, Oligotrophy, Trout, Productivity, Benthic fauna, Diptera, Oligochaetes, Fish food organisms, Streams, Specific conductance, Fish stocking, Recreation, Salmon, Water temperature, Lake marphometry, Dissolved oxygen, Plankton, Zooplankton, Aquatic insects, Fish diets, Hydrogen ion concentration, Thermal stratification.
Identifiers: *Sitka(Alas), Dolly Varden char.

Limnological studies of eight southern Alaska lakes revealed limited fish production due to their oligotrophic character and lack of shoal areas. Conductivity, except in Redoubt Lake, was less than 50 micromhos. The rating of productivity, in descending order, was Swan, Blue, Osprey, Auke, De Boer, Spurt, Redoubt, and Green Lakes. Predominant bottom fauna were Chironomidae and Oligochaeta. As pH values are correlated with fish survival, many of the southeastern Alaska lakes with low temperature, soft water, and acid bog conditions are probably unsuited for rainbow trout production. Evaluation of sport fishing resources along the Sitka area road system were conducted by walking each stream and sampling with minnow traps; particular emphasis was placed upon spawning and rearing areas and any blocks to fish passage. The Sitka area saltwater creel census determined the contribution of returning coho salmon produced from the saltwater rearing pens at Starrigavan Bay. A shoreline saltwater creel census was conducted in the Auke Creek and in the Juneau area. The recreation potential of De Boer, Spurt and Swan lakes is described. Census estimates of king, coho, Pacific halibut, sockeye, pink, Dolly Varden, cutthroat, and chum taken in Auke Creek, and in the Juneau and Sitka areas are given. (Auen-Wisconsin)
W76-01623

BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W76-01842

SOIL-GEOMORPHIC RELATIONSHIPS IN A FIRST-ORDER VALLEY IN CENTRAL NEW YORK,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-01855

APPENDICES TO: SURVEY STUDY TO SELECT A LIMITED NUMBER OF HAZARDOUS MATERIALS TO DEFINE AMELIORATION REQUIREMENTS,
Little (Arthur D.) Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-01902

8. ENGINEERING WORKS

SEWER LAYING SYSTEM,
W. R. Brown.
United States Patent 3,906,737. Issued September 23, 1975. Official Gazette of the United States Patent Office, Vol 928, No 4, p 1529, September, 1975. 1 fig.

Descriptors: *Sewers, *Sewerage, *Patents, Equipment, Installation, Tiles, Tile drains.

A tile setting piece of machinery has been patented for the laying of sewers. The apparatus consists of: a chassis trestle including parallel base rails; a pair of top rails on pillars in alignment with and above the base rails; and transverse beams connecting the respective terminal ends of both the top and base rails. A tile-bed laying car is mounted between the top rails on trolleys. One of the trolleys moves the car along the top rail. The car has side walls and end walls which form an enclosure, open at the top and bottom, to collect and pass a predetermined layer of aggregate material. The car also has a tile setting bumper projecting to the rear of the car and a push ring to engage the bell flange of a tile. A cover fill car is mounted behind the bed laying car wihtin the trestle on the trolleys. The cover fill car is also moved along the top rails, and has side and end walls, so that a predetermined layer of cover material may be released over the installed tiles. (Kramer-FIRL)
W76-01533

8A. Structures

DESIGN OF IRRIGATION RUNOFF RECOVERY SYSTEMS,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.
W76-01702

BREAKWATERS FOR LONG, SHORT AND/OR COMPLEX WATER WAVES,
K. P. H. Frey.
U.S. Patent No 3,908,384, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2068, September 30, 1975.

Descriptors: *Patents, *Breakwaters, *Coastal structures, *Waves(Water), Shore protection, Attenuation.
Identifiers: Dampening.

This invention relates to a breakwater, especially for use where a large range of wavesteepness (i.e. ratio of wave height to wave length) is encountered, such as in coastal regions of oceans and large lakes. This new breakwater is a composite device and comprises two different kinds of breakwaters. The first breakwater section is adapted to dampen relatively short waves and/or short components of a long wave. After the wave has passed this first section it encounters the second section which is adapted to dampen long waves. The second section can effectively do this because the first section acts as a primary wave control method. Sufficient amounts of energy have been eliminated before the transmitted wave reaches the second section. The first section comprises of a series of vanes the first of which is substantially below water level. The subsequent vanes are progressively higher until at least one is near to or above water level, and then one or more further vanes are positioned at one or more lower levels until the last one is again substantially below water level. The second section is a single convex surface (viewed from above) having its leading edge parallel to water level and perpendicular to the oncoming waves. The curved surface may be the upper side of a plate of any suitable material. It curves slowly upward to its trailing edge which is above water level. (Sinha-OEIS)
W76-01723

EFFECT OF VALLEY SHAPE ON RETENTION BASIN PERFORMANCE,
For primary bibliographic entry see Field 4A.
W76-01773

PREVENTION OF FRAZIL ICE CLOGGING OF WATER INTAKES BY APPLICATION OF HEAT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
T. H. Logan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-236 996, $4.00 in paper copy, $2.25 in microfiche. Report REC-ERC-75-15, September 1974. 22 p, 6 fig, 1 tab, 68 ref, append.

Descriptors: *Intakes structures, *Frazil ice, *Heating, Ice, Canals, Intakes, Ice cover, Melting, Slush, Trash racks, Barriers, Open channels.
Identifiers: Trashrack bars.

The phenomenon of ice formation in flowing water and the technology of heating trashrack bars to prevent clogging by frazil ice were reviewed. The report included: (1) a description of frazil ice formation, (2) development of heat transfer equations for trashrack bars immersed in a fluid, (3) correlation between conditions assumed in developing the theoretical expressions and actual conditions present in a water intake, (4) economics of heating trashrack bars, (5) methods of heating trashrack bars, and (6) recommendations for future studies. (Sims-ISWS)
W76-01832

8B. Hydraulics

USE OF DRAINAGE WELLS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-01566

TRICKLE IRRIGATION LATERAL DESIGN,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-01568

LOW PRESSURE JET CLEANING OF PLASTIC DRAINS IN SANDY SOIL,
Agricultural Research and Education Center, Lake Alfred, Fla.
H. W. Ford.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 5, p 895-897, September-October, 1974. 3 fig, 1 tab, 6 ref.

Descriptors: *Jets, *Drainage practices, *Subsurface drains, Cleaning, Drains, Drainage systems, Sludge, *Florida, Agriculture, Plastic pipes, Sands.
Identifiers: *Plastic drainage pipe, Gravel envelope, Jet cleaning, Corrugated pipes.

A low pressure jetting method is described for removing sludges from plastic drains and from the surrounding thin gravel envelope utilized in Florida sandy soils. There was no sand infiltration using gravel envelopes 0.75 to 1.50 in thick with corrugated plastic polyethylene pipe employed in drain installations. A low pressure jet cleaning system can function in 5-to 5-in. plastic drains up to 550 ft. in length where ochre and FeS are the primary deposits to be removed. Cleaning of the gravel envelope can be accomplished presumably by the surging action of jetting pressure. Jetting should be performed at a slow entry rate and with a hydraulic head above the drain. In sandy areas where sludges are a problem, jetting should be performed within 2 weeks after initial drain flow. (Skogerboe-Colorado State)
W76-01569

SELECTION OF ECONOMICAL PIPE SIZES FOR WATER DISTRIBUTION NETWORKS,
Applied Cybernetics, Merritt Island, Fla.
For primary bibliographic entry see Field 5F.
W76-01787

MOODY DIAGRAM FOR DIRECT PIPE DIAMETER CALCULATION,
Wisconsin Univ., Milwaukee. Dept. of Energetics.
R. Y. S. Lai, and K. K. Lee.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 101, No HY10, p 1377-1380, October, 1975. 1 fig, 9 ref.

Descriptors: *Equations, *Pipes, *Mathematical models, Flow, Design, *Moody resistance diagrams, Pipe flow, Darcy-Weisbach equation.

Determining the best pipe diameter size for rough commercial pipes is a necessary step in design for fluid flow applications. The modified Moody diagram and its associated pipe diameter formula are illustrated as a direct time-saving method for finding the desired pipe size. A continuity equation and the Darcy-Weisbach equation are derived, and a Moody diagram with an auxiliary scale Reynolds number versus the friction factor for various relative roughness has been plotted. An alternative Moody diagram for finding the diameter directly is illustrated, where a suitable scale can be found without explicitly depending upon pipe diameter in the roughness of the pipe/pipe diameter scale. (Kramer-FIRL)
W76-01793

EVALUATING THE IMPACT OF STRUCTURALLY INTERRUPTED FLOOD PLAIN FLOWS,
Cornell Univ., Ithaca, N.Y. Dept. of Structural Engineering.
For primary bibliographic entry see Field 4A.
W76-01808

HYDRAULIC MODEL STUDIES OF THE TETON CANAL OUTLET WORKS ENERGY DISSIPATOR,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
T. J. Isbester.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 610, $4.00 in paper copy, $2.25 in microfiche. Report No REC-ERC-74-16, October 1974. 23 p, 16 fig, 8 ref.

Descriptors: *Model studies, *Energy dissipation, *Head loss, *Cavitation, *Idaho, Scaling, Hydraulic models, Canals, Outlet works, Discharge(Water), Flow, Gates.
Identifiers: *Teton(Dam).

Studies were made on a 1:5.66 scale model of a single jet-flow gate and sudden expansion energy dissipator to determine discharge coefficients for full and partial gate openings, head losses through the facility, cavitation characteristics, and the backpressure requirements for the submerged jet-flow gate. The two-diameter expansion was inadequate and was replaced by a three-diameter section. A method of cavitation scaling was discussed whereby visible and/or aurally detectable model incipient cavitation was used to determine incipient cavitation lines for a series of single gate openings and a range of discharges from no-flow through that obtained at maximum head. Using the slope of the model line and the scale vapor pressure, the prototype incipient cavitation line was obtained. A white-pigmented concrete curing compound was found to be satisfactory for use as a cavitation indicator. (Bhownik-ISWS)
W76-01833

HYDRAULIC CONSTANTS OF TIDAL ENTRANCES, II: STABILITY OF LONG ISLAND INLETS,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W76-01836

TURBULENT JETS WITH REVERSIBLE BUOYANCY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-01849

8C. Hydraulic Machinery

HIGH-PRESSURE WATER JET CLEANING OF SUBSURFACE DRAINS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. B. Grass, and L. S. Willardson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 5, p 886-888 and 891, September-October 1974. 7 fig, 8 ref.

Descriptors: *Jets, *Drainage practices, *Hydraulic equipment, *Hydraulic machinery, Cleaning, Tile drains, High pressure, Drains, Drainage systems, Hydraulics, Subsurface drains, Agriculture.
Identifiers: *Jet cleaning.

High-pressure jetting equipment utilized the macerating action of high- velocity water jets and vigorous water turbulence to clean roots, silt, and chemical deposits from subsurface drains. Water existing from the rear jets propels the nozzle and hose up the drain. Two types of nozzles are most commonly used in Imperial Valley: (a) the cleaning nozzle used mainly for removing silt and mineral deposits requiring a pump pressure of 1250 psi and a nozzle pressure of 600 psi; and (b) the penetrator nozzle, used mainly for removing root plugs and the larger, more difficult accumulations of silt requiring pump pressure of 1000 psi and a nozzle pressure of 500 psi. A dewatering pump is used to remove the dislodged material arriving at the tile opening. The jet cleaning operation also can locate breaks in subsurface drain lines so that they can be repaired. (Skogerboe-Colorado State)
W76-01564

DREDGING COSTS: THEIR ESTIMATION AND IMPLICATIONS TO THE MANAGEMENT OF DREDGING OPERATIONS,
University of Wales Inst. of Science and Tech., Cardiff. Dept. of Maritime Science.
For primary bibliographic entry see Field 6C.
W76-01602

INDUSTRIAL WASTEWATER PUMPS,
Fluor Engineers and Constructors, Inc., Houston, Tex. Process Dept.
J. A. Scher.
Chemical Engineering, Deskbook Issue, p 95-101, October 6, 1975. 6 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pumps, Pumping, Equipment, Centrifugal pumps, Pump turbines, Hydraulic equipment, Hydraulic systems, Pistons, Water conveyance, Sumps, Hydraulic machiner.

An overview is given of the various types of pumps employed in the treatment of industrial effluents. The types of pumps include: centrifugal pumps; sump pumps; submersible pumps; positive-displacement piston pumps; diaphragm pumps; rotary pumps; and, peristaltic pumps. If the waste water to be pumped is not corrosive, then the pumps may be made of carbon steel, cast iron or other mild construction materials. However, if the waste water contains corrosive materials, then the construction materials must be resistant to chemicals. A table is presented which lists various construction materials and their resistance to some of the liquids commonly present as components of industrial wastes. Vertical sump pumps are ideal for use in open or closed collecting sumps, and can be controlled by float-type level controllers. Since additions for the chemical treatment of waters are usually made in terms of gal/hr, diaphragm pumps are very satisfactory. Piston pumps are used when larger capacities or higher discharge pressures are required. The pulsation of flows caused by the movement of the piston can be smoothed out by using two or three heads on the same pump. The solids content of slurries and sludges can range from 0.5% to 15% up to 75%. In general, if a slurry or sludge can be moved into the pumping elements, then it can also be moved out. Rotary pumps are the best pumps for slurry/sludge transport. They are self-priming, normally nonfouling, and provide a uniform flow. The choice of a pump for sampling has to be made individually for each particular situation. (Orr-FIRL)
W76-01661

CIVIL ENGINEERING FEATURES OF GEOTHERMAL POWER PLANT,
Pacific Gas and Electric Co., San Francisco, Calif.
S. Peters.
Journal of the Power Division, American Society of Civil Engineers, Vol 100, No PO2, p 157-173, December 1974. 11 fig, 2 tab, 23 ref.

Descriptors: *Geothermal studies, *Thermal powerplants, *Steam, *Thermal water, *Cooling water, *Wells, Construction costs, Thermal water, Geology, Geophysics, Heat flow, Powerplants, Thermal power, Piping systems(Mechanical), Electric power production, Engineering structures, Waste water disposal, Injection wells, Cooling towers, Seismic properties.
Identifiers: Civil engineering features, Pacific Gas and Electric Company(Cal), Site selection, Steam productivity, Geothermal plants.

A description is presented of the civil engineering features, the geology, seismicity, and the reservoir mechanism of the Geysers geothermal power project developed by the Pacific Gas and Electric Company, San Francisco, California. Site selection, construction materials, and plant design are also discussed. Steam productivity of the well is expected to decline with time, and new wells are drilled to maintain the steady supply of steam for the plant. By drilling wells at one per 40 acres, the production rate is better maintained. Geothermal plants, which do not require a supplemental source of cooling water, produce about 20 percent more condensate than is evaporated. This surplus is reinjected into unproductive wells which not only present the most efficient method of wastewater disposal, but also might prolong the life of the well field. Construction cost of geothermal capacity is about $150 per kilowatt, compared to $400 per kilowatt for fossil fuel plants and $600 per kilowatt for nuclear units. (Robinett-Arizona)
W76-01701

STAGE 1 DEVELOPMENT OF THE SHOALHAVEN SCHEME-I.
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 6B.
W76-01732

HYDRAULIC MODEL STUDIES OF THE TETON CANAL OUTLET WORKS ENERGY DISSIPATOR,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W76-01833

8D. Soil Mechanics

RESPONSE OF SATURATED SANDS TO CYCLIC SHEAR AT EARTHQUAKE AMPLITUDES,
Kentucky Water Resources Research Inst., Lexington.
V. P. Drnevich, and J. P. Jent.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 551, $4.00 in paper copy, $2.25 in microfiche. Research Report No 87, October 1975. 35 p, 12 fig, 4 tab, 11 ref. OWRT A-044-KY(1). 14-31-0001-3817, 14-31-0001-4017.

Descriptors: *Earthquake engineering, *Failure, *Modulus, *Sands, Sand aquifers, Seismic design, *Seismic properties, Shear strength, Soil dynamics, Soil mechanics, *Soil properties, Soil strength, *Soil testing, Stress analysis.
Identifiers: Damping, Liquefaction, Shear modulus, Simple shear, Undrained cyclic shear.

Both quasi-static and resonant cyclic shear tests were performed on hallow cylindrical specimens of saturated sands at various densities and confining stresses. Shear moduli measured at nondestructive amplitudes were shown to be independent of frequency for the range of 0.1 Hz to 50 hz. Application of cyclic shear at larger amplitudes caused effective stresses to decrease and failure. The number of cyles to failure was related to ratio of cyclic shear stress to maximum drained shear stress. Effective confining stress reduces approximately linearly with number of cycles. Shear modulus and shear damping can be described by the Hardin-Drnevich equations if change in effective stress is properly adjusted. Procedures were developed to use research results in analyzing soil in dam or other profiles to predict factor of safety against liquifaction failure and to estimate shear modulus and damping of soils for subliquefaction conditioning when these soils are subjected to earthquakes. (Huffsey-Kentucky)
W76-01814

MEASURING SOIL CREEP,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 7B.
W76-01856

8E. Rock Mechanics and Geology

OPTIMUM DESIGN OF DUG-WELLS IN HARD ROCK TERRAINS,
Osmania Univ., Hyderabad (India). Dept. of Geology.
Y. Janardan Rao, B. E. Vijayam, C. Sudarsana Raju, and M. Papi Reddy.
Indian Farming, Vol 25, No 3, p 8-12, June 1975. 3 fig.

Descriptors: *Water wells, *Dug wells, *Shallow wells, *Granites, *Water supply, Water sources, Groundwater, Groundwater mining, Water table, Well data, Water yield, Permeability, Wells, Sedimentary rocks, Hydrogeology, Boreholes, Joints(Geologic), Fracture permeability, Fractures(Geologic).
Identifiers: *Well design, Dykes, Indian, Hyderabad(India).

A description is presented of the problem of optimum design for dug-wells in hard rock areas, taking into account various factors relating to discharge, diameter, depth and storage capacity. The study areas in India fall into 3 distinct geological groups: (1) the granitic areas of Hyderabad, Nalgonda, Krishna, Guntur and Prakasam districts of Andhra Pradesh; (2) the sedimentary areas of Rayalaseema and adjoining parts of Telangana region; and (3) the Deccantrap area of Hyderabad district. For granitic rocks the open wells should be dug up to the bottom of the weathered zone, which is about 10 to 15 meters in Hyderabad region. Dug wells should be rectangular, with the longer side perpendicular to the strike of the shear zone or joint pattern. Since dykes act as barriers for groundwater flow, wells should be located on the upstream side of the strata. Wells located in pink granitic terrain have better chances of greater yield than do wells in the gray granite area. It is not advisable to deepen a dug-well beyond the weathered zone, but bores can be used on the side where fissures or fractures are present. (Robinett-Arizona)
W76-01892

8F. Concrete

PRECAST CONCRETE PILES CUT PLANT CONSTRUCTION COST,
Onondaga County Dept. of Drainage and Sanitation, N.Y.
J. J. Hennigan.
Public Works, Vol 106, No. 10, p 84-85, October, 1975. 1 fig.

Descriptors: *Construction materials, *Construction costs, *Treatment facilities, Costs, Environmental effects, Concrete technology, Waste water treatment, Industrial wastes, Sewer systems, New York.
Identifiers: Onondaga Lake(NY).

While the decision to provide secondary treatment of municipal and industrial waste water at the Metropolitan Syracuse Treatment Plant was made in 1965, several problems have delayed construction of the 83-mgd plant for over ten years. Preliminary studies were required, including an in-depth study of Onondaga Lake, a survey of the waste discharges of 140 industries which discharge to the sewer system, and associated investigations of joint municipal-industrial waste treatment feasibilities. The 1972 Amendments to the Water Pollution Control Act necessitated the adherence to new requirements, including infiltration/inflow studies, environmental impact and assessment statements, and public hearings. The final problem was the cost of steel product, in particular the required 1,125,000 linear feet of piping. Due to steel shortages and excessive prices in the summer of 1974, precast concrete piles were considered as an alternative. These prestressed concrete piles were eventually chosen, after the testing of a splice capable of taking tension. The price of construction, using the prestressed concrete piles rather than those of steel, was $86.7 million, about $22 million less than the original engineering estimate. (Kramer-FIRL)
W76-01560

8G. Materials

DEVELOPMENT OF ASPHALT CUSHIONED PLASTIC REINFORCED ASPHALT MEMBRANES FOR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W76-01812

RESPONSE OF SATURATED SANDS TO CYCLIC SHEAR AT EARTHQUAKE AMPLITUDES,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 8D.
W76-01814

8I. Fisheries Engineering

TOXICITY OF ROTENONE TO SOME SPECIES OF COARSE FISH AND INVERTEBRATES,
Ministry of Agriculture, Nairobi (Kenya). Water Dept.
For primary bibliographic entry see Field 5C.
W76-01534

AN EXPERIMENT OF FASTER GROWTH OF SALMON SALMO SALAR (L.) IN A SCOTTISH STREAM,
Freshwater Fisheries Lab., Pitlochry (Scotland).
H. J. Egglishaw, and P. E. Shackley.
J Fish Biol. Vol 5, No 2, p 197-204. 1973.

Descriptors: *Salmon, *Trout, Fish populations.

The experiment was made in an attempt to modify the usual relationship in which young trout grow faster than young salmon in streams in which they occur together. A stretch of a trout stream was stocked with advanced salmon eggs, which produced fry earlier than the trout eggs laid naturally. The salmon grew faster than the trout and were longer than the trout at the end of the growing season. The mean length of 77.7 mm attained by the salmon is the largest known size reached by salmon in their 1st yr when feeding on natural food supplies in streams in Scotland. Survival rate from egg planting to production of salmon of this mean length was high.--Copyright 1973, Biological Abstracts, Inc.
W76-01537

TESTS OF ESTIMATES OF PREFERRED SPAWNING AND REARING DISCHARGES FOR TROUT IN SELECTED STREAMS IN WASINGTON,
Geological Survey, Tacoma, Wash.
C. H. Swift, III.
Administrative Report, 1975. 83 p, 40 fig, 3 ref.

Descriptors: *Fish management, *Spawning, *Trout, *Washington, Streams, Methodology, Equations, Streamflow, Discharge(Water), Regression analysis, Evaluation.
Identifiers: *Steelhead trout(Wash).

Estimates of spawning and rearing discharges for steelhead trout were tested in three streams in western Washington and for six species of resident trout in three streams in northeastern Washington. The estimates were obtained from a set of multiple-regression equations that were previously developed on a study of 54 reaches on 18 streams in western Washington. The equations for calculating spawning and rearing discharges for steelhead were tentatively verified for western Washington streams by the finding that two-thirds or more of the determined discharges were within one standard error of estimate of the discharges estimated from the regression equations for nine study reaches on the Samish River, Cloquallum Creek, and Middle Fork Satsop River. However, the equations for steelhead are not generally applicable for estimating spawning and rearing discharges for resident trout in northeastern Washington, as indicated by the finding that most of the discharge determined at nine study reaches on Mill Creek, Deep Creek, and Chewelah Creek were not within one standard error of estimate of discharges estimated from the equations. (Woodward-USGS)
W76-01575

EFFECTS OF A PARASITIC GUT NEMATODE ON CONSUMPTION AND GROWTH IN JUVENILE RAINBOW TROUT (SALMO GAIRDNERI),
California State Dept. of Fish and Game, Sacramento. Regional II.
J. J. Hiscox, and R. W. Brocksen.
J Fish Res Board Can. Vol 30, No 3, p 443-450, 1973. Illus.

Descriptors: *Trout, Nematodes, *Fish parasites.
Identifiers: Bulbodacnitis Ampullastoma, Lepomis Cyanellus.

A technique was developed for differentially infecting juvenile rainbow trout, S. gairdneri, by introduction of the parasitic gut nematode, Bulbodacnitis ampullastoma. Desired infection levels were induced in trout with 80% success. B. ampullastoma affected growth and food consumption of trout in the laboratory. The effects of the parasite were evident at low and high ration levels. At low and starvation ration levels the parasite effected a withdrawal of the energy stores of the fish. At higher ration levels, the direct effects of the parasite were compounded by apparent parasite interference with food assimilation by the fish. B. ampullastoma was directly infective to a warm-water fish, Lepomis cyanellus.--Copyright (c) 1973, Biological Abstracts, Inc.
W76-01622

INVENTORY AND CATALOGING OF SPORT FISH AND SPORT FISH WATERS IN SOUTHEAST ALASKA,
Alaska Dept. of Fish and Game, Juneau.
For primary bibliographic entry see Field 7C.
W76-01623

STRUCTURE OF THE PLANKTON COMMUNITY OF FISH-REARING PONDS OF THE SOUTHERN URALS, (IN RUSSIAN),
Ural and Siberian Fishery Scientific-Research and Planning Inst., Sverdlovsk (USSR).
Yu. G. Andreyashkin, T. S. Lyubimova, and M. I. Yarushina.
Ekologiya. 5(4): 53-60. Illus. 1974.

Descriptors: *Plankton, *Mathematical studies, *Analyses, *Carp, Fish, *Fish populations, Algae, Zooplankton, Ponds, Fish hatcheries.
Identifiers: pH, Ponds, Urals, USSR.

The results of a mathematical analysis of the plankton community in carp rearing ponds (biomass and hydrochemical characteristics) are presented. The populations are joined in groups related by favorable intragroup influences. Dominance of a particular group of algae depends mainly on the pH of the water, and dominance of the zooplankton groups depends on the composition and state of the algal mass.--Copyright (c) 1975, Biological Abstracts, Inc.
W76-01700

RELATIONSHIP OF DISCHARGE REDUCTIONS TO AVAILABLE TROUT HABITAT FOR RECOMMENDING SUITABLE STREAMFLOWS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 4A.
W76-01809

DETERMINATION OF THE NUMBER OF COMMERCIAL AND NONCOMMERCIAL RECREATIONAL BOATS IN THE UNITED STATES, THEIR USE, AND SELECTED CHARACTERISTICS,
For primary bibliographic entry see Field 6B.
W76-01817

EFFECTS OF QUALITY AND QUANTITY OF FOOD ON GOLDEN SHINER, NOTEMIGONUS CRYSOLEUCAS, PRODUCTION,
Arkansas Univ., Fayetteville. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W76-01900

ENTRAPMENT OF FISHES ON INTAKE WATER SCREENS AT A STEAM ELECTRIC GENERATING STATION,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
B. Grimes.
Chesapeake Science, Vol 16, No 3, p 172-177, September 1975. 3 fig, 2 tab, 11 ref.

Descriptors: *Sampling, Fish migration, Fish, Mortalities, Temperature, Water quality, Thermal powerplants, Diurnal, Water pollution effects.
Identifiers: *Fish entrapment.

To investigate entrapment of fishes, travelling intake water screens were sampled monthly in 1969 and 1970 at a steam electric power station near Crystal River, Florida. Samples contained 73 species representing 41 families; the majority of individuals were juveniles of weak-swimming species. There was an inverse relationship between intake water temperature and catch. Highest mortalities occurred with the first cold temperatures of winter and later with lowest water temperatures. Comparison of catch-per-unit-effort during daylight and darkness in 1970 showed monthly catch-per-hour for dark sampling approximately equal to or greater than for light. Greatest disparities between day and night sampling occurred simultaneously with coldest water temperatures. (Klein)
W76-01939

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

AN INFORMATION RETRIEVAL SYSTEM FOR THE MACROINVERTEBRATE FAUNA OF INDIANA RIVERS AND LAKES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02I.
W76-01513

10C. Secondary Publication And Distribution

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SIXTH VOLUME.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 06A.
W76-01517

BIBLIOGRAPHY ON NUTRITIONAL REQUIREMENTS OF WARM WATER FISHES (BIBLIOGRAPHIE SUR LES BESOINS NUTRITIFS DES POISSONS VIVANT EN EAUX CHAUDES),
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station; and Ministry of Agriculture, Dor (Israel). Dept. of Fisheries.
For primary bibliographic entry see Field 02I.
W76-01915

10D. Specialized Information Center Services

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Krannert School of Industrial Management. Lafayette, Ind.
For primary bibliographic entry see Field 05G.
W76-01502

10F. Preparation Of Reviews

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON MANGANESE.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
For primary bibliographic entry see Field 05A.
W76-01863

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ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W76-01564--01569	6
Cornell University, Policy Models for Water Resources Systems	W76-01899	1
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Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W76-01816	1
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University of Wisconsin, Eutrophication	W76-01651--01658 01893--01898	14
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B. STATE WATER RESOURCES RESEARCH INSTITUTES	W76-01501--01513 01522--01526 01683--01690 01803--01815	39

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SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
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Effects of Pollutants on Aquatic Life (Katz)	W76-01900--01917 01920--01951	50
Environmental Protection Agency	W76-01861--01877	17
Ocean Engineering Information Service (Patents)	W76-01713--01718 01721--01728 01730--01731	16
Office of Water Research and Technology	W76-01514--01521 01682 01797--01802	15
U. S. Geological Survey	W76-01570--01590	21

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